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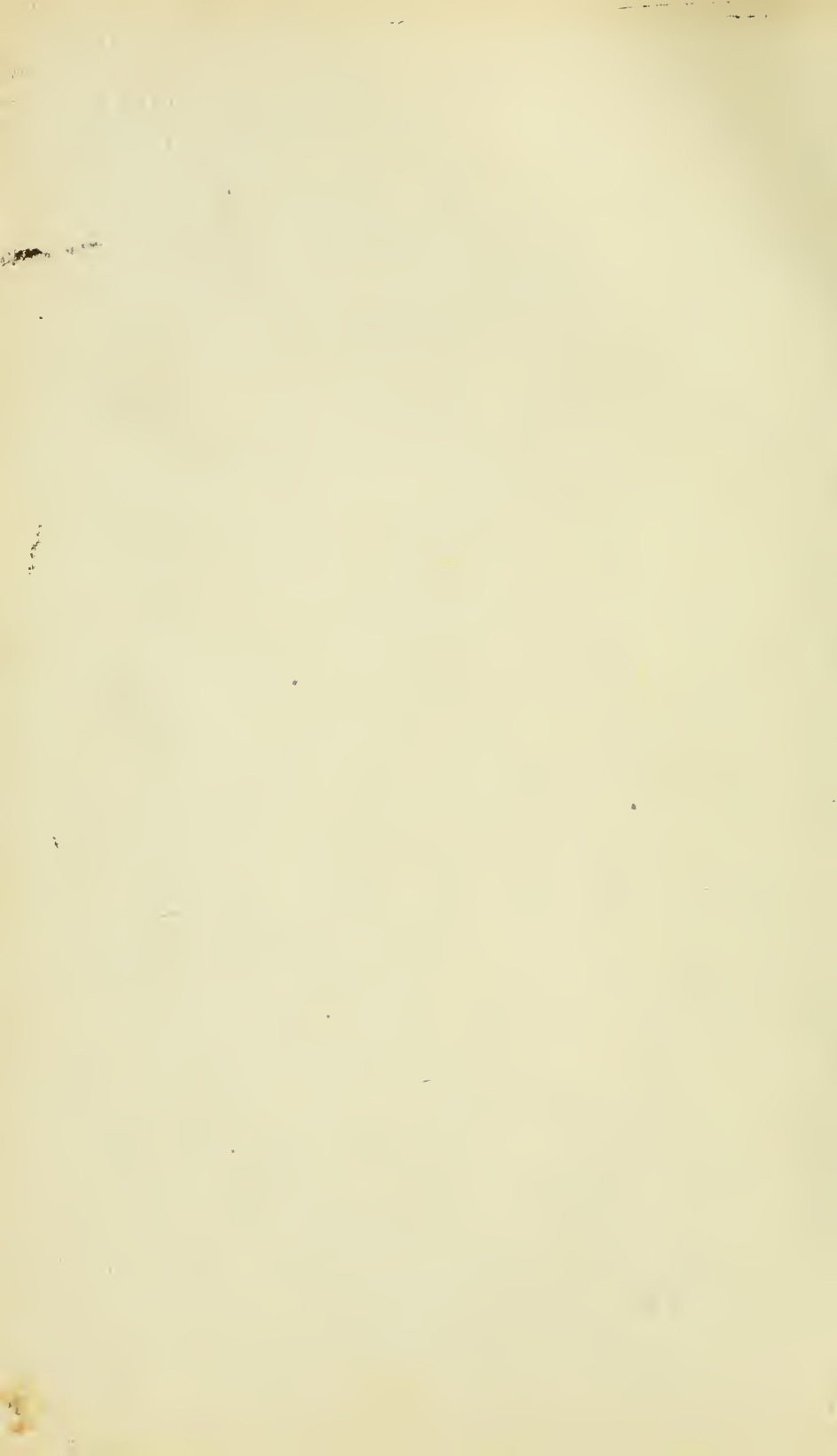
H. J. Wilson

No.

If thou art borrowed by a friend,
Right welcome shall he be,
To read, to study, not to lend,
But to return to me.

Not that imparted knowledge
Doth diminish learning's store;
But books, I find, if often lent,
Return to me no more.

Read carefully, pause frequently, think seriously,
and return duly, with the corners of the leaves
not turned down.



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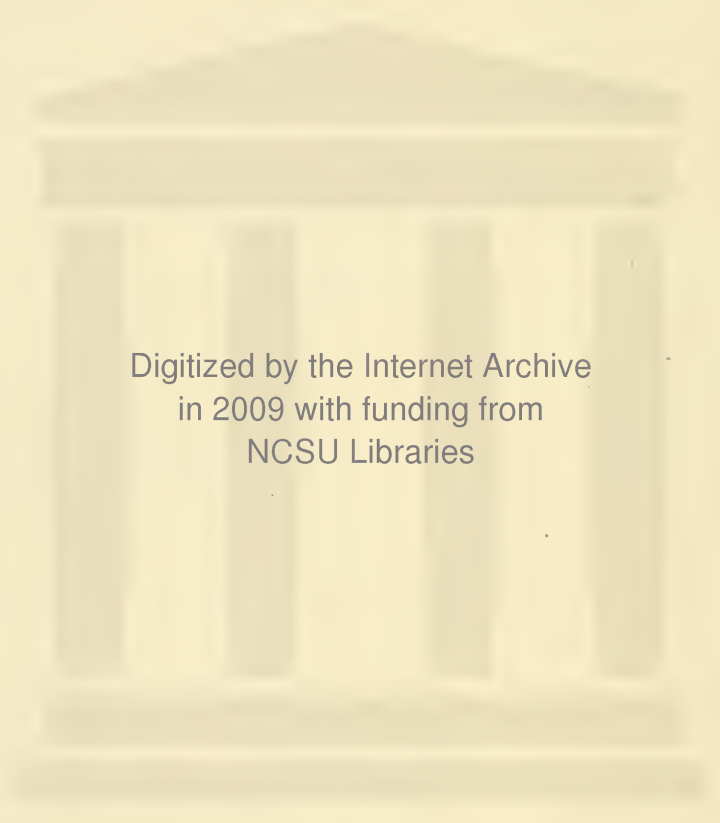
EXCELLENT AMERICAN
LITHOGRAPHED ARCHITECTURAL
STUDY - BUFFALO - 1856

Filed - 11/11/19

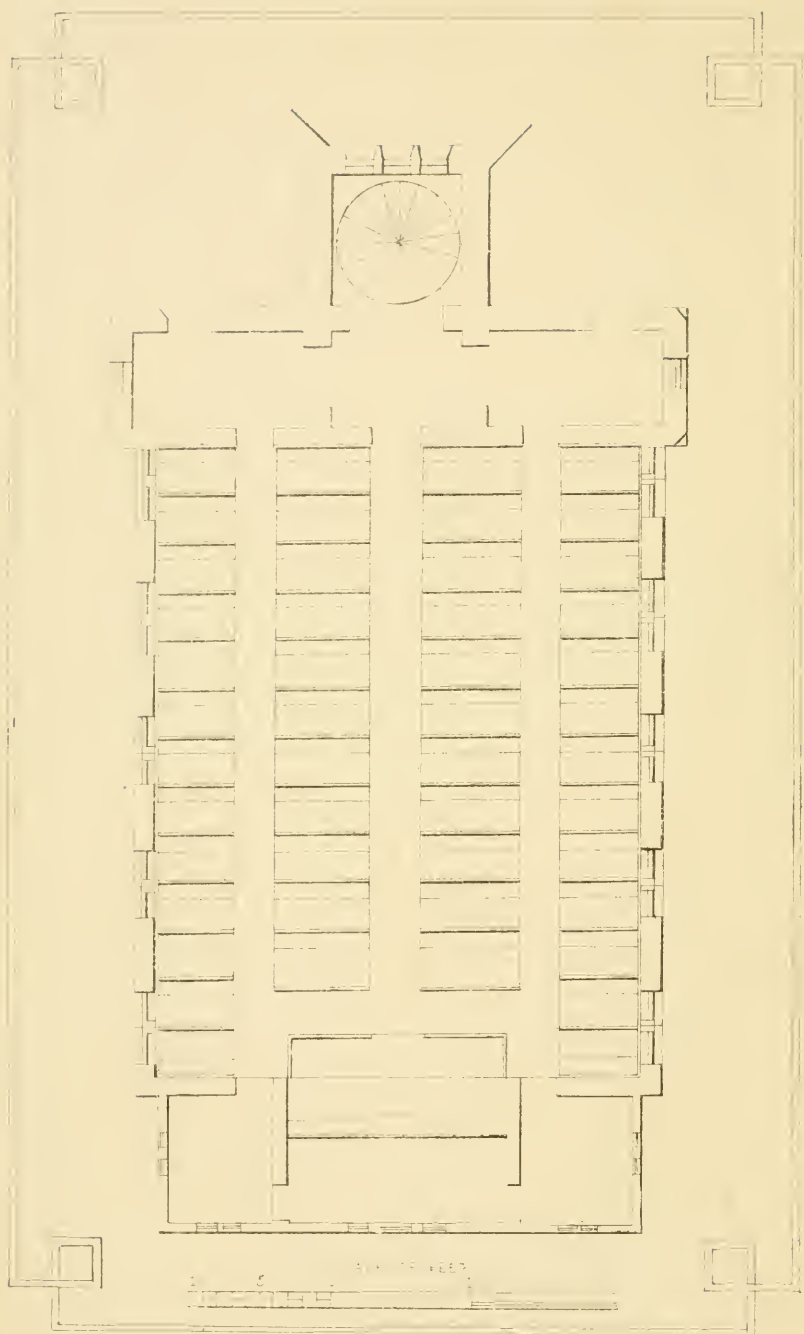
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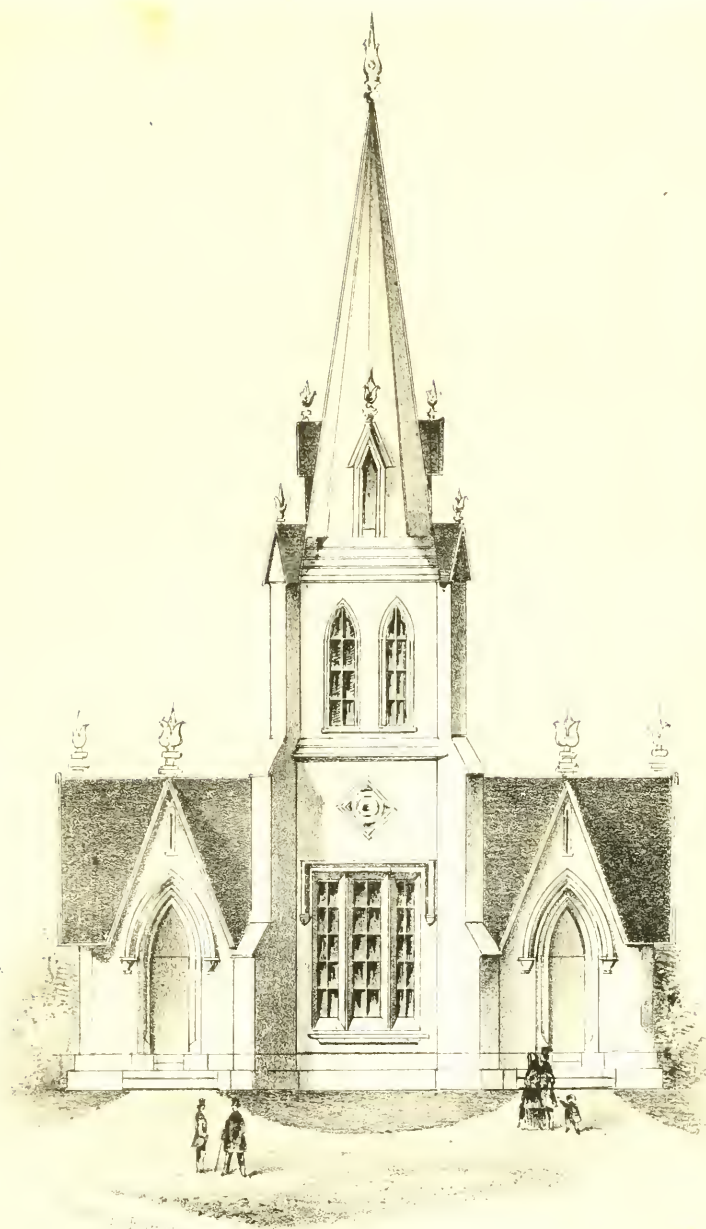


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PLAN I





THE
ECONOMY
OF
Church, Parsonage and School
ARCHITECTURE,

ADAPTED TO SMALL SOCIETIES AND RURAL DISTRICTS.

BY CHAS. P. DWYER,

Architect and Civil Engineer; Author of "The Economic Cottage Builder," "Practical
Masonry," etc., etc.



BUFFALO:
PHINNEY & CO., PUBLISHERS.
1856.

Entered according to Act of Congress in the year 1856,
By CHAS. P. DWYER,
In the Clerk's Office of the District Court for the Northern District of New York.

CHAS. E. FELTON,
STEREOTYPER, . . . BUFFALO.

DEDICATION.

TO THOSE INESTIMABLE FRIENDS
OF CIVILIZATION,
THE TEACHERS OF THE PULPIT AND THE DESK,
THIS WORK IS ADMIRINGLY
INSCRIBED,
BY ITS AUTHOR.

CONTENTS.

CHURCH ARCHITECTURE :

Preliminary Thoughts,.....	9	Unity of Effect,.....	23
Site,.....	14	Interior Coloring,.....	25
Foundation and Basement,.....	15	Choice of Style,.....	26
Walls,.....	17	Grecian Style,.....	28
Floor and Roof,.....	19	Romanesque Style,.....	32
Choir, or Organ Gallery,.....	20	Primitive Gothic Style,.....	39
Fitness of Style,.....	22	Pointed Style,.....	41

PARSONAGES :

General Specification,.....	45	Construction in Stone,.....	54
Construction in Wood,.....	47	Construction in Brick,.....	56

SCHOOL ARCHITECTURE :

Construction, in wood, No. 1,.....	59	Construction No. 5,.....	64
Construction No. 2,.....	61	Construction No. 6,.....	65
Construction No. 3,.....	62	Construction No. 7,.....	67
Construction No. 4,.....	63	Construction No. 8,.....	68

GENERAL REVIEW :..... 73

LIGHTNING CONDUCTORS :..... 75

WATER :

Hard and Soft,.....	79
---------------------	----

ESTIMATING :..... 81

ADDENDA :

Desk and Seat,.....	89	Interior Coloring,.....	91
Wall Furniture,.....	92		

ILLUSTRATIONS.

CHURCHES :

Grecian Style,	23	Primitive Style,	39
Romanesque Style,	32	Pointed Style,	41

PARSONAGES :

Nos. 1, 2, 3, 4, 5, 6, 7, 8,	47
------------------------------------	----

SCHOOLS :

Design No. 1,	59	Design No. 5,	64
Design No. 2,	61	Design No. 6,	65
Design No. 3,	62	Design No. 7,	67
Design No. 4,	63	Design No. 8,	68

PREFACE.

THERE are no two institutions of civilization more intimately connected with each other, in all the interests which tend to sustain each, than those of the CHURCH and the SCHOOL.

The Church is the great teacher of Eternal Truth; while the School is the temporal monitor and guide which leads the growing intellect to reverence at the shrine of that Almighty Being whose breath has fanned it into existence, and whose final fiat awaits its judgment-day.

The author of the present treatise has chosen this theme as a fitting successor to that of "Cottage Building;" for, what is a home without those aids of human and divine instruction which teach us to appreciate God's works upon earth, and to aspire to our legitimate position in immortality.

CHURCH AND SCHOOL ARCHITECTURE belongs not exclusively to the wealth of cities. Its calm and simple dignity gains nothing by the puerile ornament of lavish extrava-

gance. The vast universe which we inhabit is of such unimaginable grandeur and wonderful appropriateness, that it were the merest vanity to dream of piling up an edifice with human hands worthy of any other end than to stand as a Babylonian testimony of man's infinitesimal smallness, and the pitiable weakness of his vaunted power, when placed in contrast with the works of that Architect whose design is faultless, and whose execution is perfection itself.

It is the neighborhood of sylvan-clad Nature that we seek as the fitting site for the simple structures we now introduce to our readers in the following pages; and our liveliest ambition is, that through the unpretending medium of this little book, each rural district may obtain a hint to help in the erection of those landmarks so dear to the heart which first received its pure impressions within their modest walls—the CHURCH and the SCHOOL.

C. P. DWYER.

BUFFALO, March, 1856.

CHURCH ARCHITECTURE.

PRELIMINARY THOUGHTS.

IN taking up the subject of Church construction, there are some points worthy of particular attention; namely, the absolute necessity for hearing distinctly in every part of the building; the advantage of a judicious introduction of light; the securing of warmth in winter and coolness in summer; and lastly, the facility of ingress and egress, and perfect accommodation of the auditory.

In order to insure the valuable privilege of catching, without effort, every word that falls from the minister, or every tone of harmony wafted from the tuneful choir, it must be borne in mind that the formation of the interior has the chief bearing on this requisite. A room the walls of which are circular, or even elliptical, will give an echo; for the reason that *sound* is governed by precisely the same laws as *light*; and, therefore, *reflection* in the one is the same production as in the other.

Now, let any inquiring person apply his moistened finger to the perimeter of an ordinary drinking-glass, and by pushing it around he will produce one continued volume of sound, which will last just precisely as long as the finger keeps moving around the circle.

It is thus with the walls we speak of, particularly if

smoothly plastered: the speaker is discomposed by the rolling echo of his own voice, sent back upon him, as if in mockery, while his hearers seek in vain to distinguish between the substance and its shadow—for so may we consider the voice and its echo.

A Church that has cloisters, or deep recesses, is subject to this unpleasant echo; but, as in this treatise we have nothing to say to the more pretending edifices, it is not necessary to more than allude to the fact as part proof of the theory of reflection of sound. The conclusion to be drawn, then, is, that an unbroken circular wall should be avoided, and that transepts, or wings, are more or less inimical to the clear and unimpeded transmission of sound. The square, or the oblong, are unquestionably the most desirable forms; and these must be assisted by a reasonable height of ceiling—otherwise the voice will often lack the power necessary to reach the opposite end from that whence it starts; for, sound will ascend before it seeks its level. As in the instance of a cannon fired at a distance from an observer, his eye detects the flash instantly, at its birth; while his ear fails to catch the accompanying sound until it has gone *upward*, and passing over the exhalations of the intervening space, descends to its level and his ear.

It should be noted by the reader that every breath exhaled by an audience tends to oppose the direct transmission of sound. Let any one go into a church or a lecture-room when it is empty, and try his voice; let him go into either of those places when filled with an audience, and make the same trial, and he will not fail to come to the conclusion that we have here laid down.

There is a proportion necessary to be observed in building with a view to the due conveyance of sound. But, as the strict standard can not at all times be adhered to, owing to other necessities which must be taken into consideration, it must nevertheless be kept in sight as much as possible.

Galleries on the sides of a church, if deep, tend to obstruct both the sight and hearing of those under them on the floor below, unless the pulpit or reading-desk be placed low enough to meet the necessities of the case.

The best proportion for practical purposes is to have the Church *double its breadth in length*, and *two-thirds of its breadth in height*.

The elevation of the galleries should be such that a line of sight drawn from the eye of an observer standing in the remotest spot should clear the point where the minister's head is supposed to be in the pulpit.

This rule is likewise applicable to the locating of the pulpit. And, indeed, it may be as well to observe that a little lower is much better than a higher position for the speaker and his hearers also, if it were for no other reason than that the latter can at less inconvenience keep their eye upon him, (that is, those whose pews are in his immediate locality.)

Where Galleries are used, it would be very well to let the surface of the ceiling decline from front to rear—thus the voice of the minister would inevitably be borne into the remotest part, and the light from the lower section of the windows be refracted by the white surface, and become more available to the body of the church than it is under

the present arrangement of level ceilings, or those inclined parallel to the gradation of the gallery itself.

The judicious introduction of light is the consideration which should occupy a kindred place with that just noticed.

There may be such a thing as *over-lighting* a church; or in plainer terms, admitting too great a glare. This is a very serious defect, and one which in Church Architecture is unpardonable; for such an important matter is the just arrangement of light that it may be said to contain within itself the very element of which piety is composed; namely, solemnity of feeling, which is productive of sobriety of thought, and intuitively leads the soul to commune with its Creator. Profuse light, on the other hand, bears on its gaudy wings the glare and glitter of the outer world, and abstracts the mind, however purely intentioned.

The heathens had a juster idea of this power of light than we in our day of boasted civilization possess. They excluded it altogether from their fanes, and substituted for it the somber light of an oil lamp. There is not a single example on record of a Grecian temple having windows; or, indeed, any aperture save the door.

It is not to be understood that we would counsel the adoption of this heathen darkness; but we would decidedly uphold the doctrine of sobriety of light in churches, let it be produced either by having less windows, narrow apertures, or, if the windows must needs be there, to have the glass stained with rose, or any other color which may blend the feelings with the religious object sought for in that holy place.

Heating and Ventilation come next under our observa-

tion. Both are objects of great interest in the construction of churches; and a want of either would be certain to render uncomfortable any building in other respects admirable.

Stoves in churches are accompanied by inconvenience; for, those who are placed in the immediate neighborhood are apt to suffer from heat, while those at a distance are uncomfortably cold.

Again, the use of stoves has one serious drawback above all others; namely, that the *feet* are cold, while the *heads* of the congregation are warm, if not hot; thus reversing the order required for a healthful arrangement of heat.

Heat should invariably be introduced through the floor, or at least on a line with it.

Lastly, as to the complete comfort of a congregation: the plan of pews or slips should be especially attended to, and the one main object held in view—that of affording ample room to every sitter.

Pews should on no account be crowded; better to enlarge the Church than to incommode the congregation.

With these preliminary observations, we now enter upon the particulars of our subject.

THE SITE.

THE Church should stand as nearly in the center of its own district or parish as possible; and this great desideratum can be far easier attained in the country than in towns. But, in no case should it be placed next to a noisy thoroughfare. A distance of one hundred yards is not too much, if the foreground be tastefully laid out, and judiciously planted.

The site should be somewhat elevated, so that the House of God may be seen from a distance—the sacred Ark of the Covenant presiding over the troubled waters of a restless world;—and that the soothing sound of its inviting bell may reach, unimpeded, the ears of its most distant children, calling the faithful flock to the Sabbath fold.

THE FOUNDATION AND BASEMENT.

THE plan of the Church being agreed upon, and not to be deviated from, the first step toward its execution is the marking out of the foundations, which should always be at least one foot wider and longer than the plan lines; that is, six inches all around.

In case a proper instrument is not at hand to *square the outlines*, it is only necessary to take an ordinary line or pack-thread, and with two stakes set it down parallel with the street or road; then take another similar line, of the intended length of the building, and join it at a right-angle with the first line at either corner, and where the corner of the building is to be; next, measure off on the front line, (beginning at the corner,) four feet; then on the side line, (beginning as before,) three feet; lastly, take to join these two points, five feet, and thus will a perfectly true angle of ninety degrees be found, which being repeated at the other corners, will square the foundations to a nicety.

It now becomes necessary to mark those outlines of foundations on the ground, and to remove the surface of the whole included area to a depth of four feet, by first plowing, and then drawing off the earth to the outside.

The sewer, or rain-water drain should then be cut out, to run from the highest part of the ground to the lowest. It

may be of a V form, made of boards and covered with plank, of any suitable dimensions, from six to ten inches wide, and from three to six inches deep.

This drain will always secure the walls against damp arising from snow or rain.

The foundation trenches should now be sunk at least a foot and a half below the line of basement floor, care being taken to make the foundation under the tower (if there is to be one,) half again as wide as that for the church.

The basement should be built up at least three feet above ground, so as to leave room in it for a furnace and fuel.

THE WALLS.

OF the material of which the walls shall be constructed, everything depends on the locality. But, whether it be of wood, stone or brick, it is very essential that it should be of durable construction, and the first cost prove to be the only cost for years.

Even though timber be cheap, it is not most desirable to use such material, if that which is more durable and less liable to be consumed by fire can be at all procured.

There are few localities in which stone can not be procured, or brick be made, and therefore it becomes a matter of moment to build of such.

Yet where none of those materials can be had, concrete is far more desirable than timber, and should, as a matter of necessity, be used.

But, whatever be the material of which the walls may be built, it is very desirable that they be of sufficient thickness to insure the most perfect stability.

A passage of three or four inches should be left in the thickness of the wall, to insure its dryness; in which case the necessity for lathing is done away with, except where framework is used. In brick or stone-work this air-passage must have bonds at every ten or twelve inches in height, and at every thirty-two inches in length.

The walls for a Tower should be built independent of the main building, so that should a settlement take place in the former, the latter might not suffer. In such construction, it is to be understood that the wall of the Tower is to be built as close up to that of the main building as though they were actually one.

THE FLOOR AND THE ROOF.

THE beams running through for flooring joists to bear upon should always be supported by brick or stone piers, solidly built. On the sides or cheeks of those beams, even pieces of scantling should be nailed, to support a sheeting of plank, which may also be sustained along its surface, by being nailed to the bottom of joists; and when these joists are all laid, a composition of five parts sand and one part lime, sufficiently saturated with water, may be turned in until it is two or three inches thick. The flooring-boards may then be laid, as usual; and a compact, air-tight, permanent floor is thus formed, far superior to that in ordinary use.

The Roof of a Church is an object worthy of mature consideration; the chief points in which are, the acquirement of strength without any unnecessary use of material, and the mutual dependence of each and every part in the formation of a frame, which, at the same time that it possesses sufficient power in itself to resist pressure, it gives no undue pressure to the walls themselves on which it has its bearing. And herein consists the requirement for a *perfect roof*.

Science, in its theory and practice, has established some very good constructions of roofing, and it is doubtful whether much more can be added to the knowledge already acquired on this subject.

THE CHOIR, OR ORGAN GALLERY.

IN the country, as in the city, a strong desire exists to have Divine Worship accompanied by music. A gallery exclusively for that purpose is therefore always necessary.

The location and arrangement of this gallery must command special attention; for, much depends on both. A well-constructed organ gallery is not alone desirable to the congregation, who are anxious to hear; but it is of very great advantage to the choir, who wish to be heard with the least possible effort to themselves.

For all purposes of hearing, the acoustic shell is well calculated. This is a construction of sound-board adapted by its plan of surface to catch the rays of sound emanating from the voice or voices of persons placed on a certain focal-line, and reflecting back the sounds upon the hearers, for whom they were intended. For pulpits or choirs they are alike excellent; and whether used in small or large churches are never out of place.

The simplest rule to adopt in the striking out of the necessary curvature is, to take the seats as a base-line, and, taking the furthestmost part of the church, or room, as a center or axis, describe a segment of any convenient height. For a pulpit, this segment should not protrude beyond the head of the speaker, nor be broader than the pulpit itself. The curvature for the choir is found in a similar manner, and

it need not protrude beyond one-half the depth of the gallery.

This acoustic shell, whether used for Pulpit or Choir, should be hollow-backed. That is, the shell should be conveniently free from the wall at its back, and have no filling or boxing. Thus, an echo or reverberation of sound is avoided, which would inevitably accompany such boxing.

FITNESS OF STYLE.

THE peculiar feature of any locality should govern the style of its architecture. Thus, for instance, if the neighborhood be thickly wooded, what style more consonant can be found than that called "Rustic Gothic?" In it are to be seen all the little details which give unity of expression, and which in themselves resemble those sylvan temples which Nature's unerring hand has reared and specially dedicated to the Deity, to whom the feathered choristers, which inhabit its branching aisles, send up their songs of morning salutation and of evening praise.

And again, in the neighborhood of a stone quarry, where the country around is intersected or bounded by bold, rocky scenery, what style is more fitting for the temple of the Deity who presides than that bold, massive, simple Saxon which belongs to such a place.

The city, more polished in art, may claim as its own the rigidly classic Grecian, the more ornate Roman, or the gorgeously fantastic Gothic.

In fact, every locality has its peculiar style, and should have its claim allowed.

But, whatever be the style, let it be pure and unadulterated; for, in that very purity lies the secret of true beauty, founded on legitimate connection alone, and accountable only to its parent thought for the seeming discrepancies in its features.

UNITY OF EFFECT.

IN the preceding chapter we have spoken of the fitness of style. We now proceed to the naturally succeeding subject—the unity of effect.

The first point to which we would call attention is the necessity for an agreement between the exterior and interior of the building in its style. There can not be anything more truly absurd, or more painful to a mind capable of any discernment, than a deviation in this matter. And here Nature gives us a most impressive lesson, in the fact that where she has given a handsome figure or face to man, any attempt to improve on it is hurtful to her first design; and where she has formed an ugly face, the addition of a few pleasing features would but tend to make it monstrous, by presenting a striking and positively painful contrast.

Unity of design is the one pervading beauty of this faultless system in which we live, and its influence upon our senses generates that wonder and delight which give to man the greatest pleasure he is capable of enjoying; for, from the contemplation of perfection, the soul instinctively turns to the adoration of Him who is its Author.

In Church Architecture, how necessary it is that this *unity of design* should be preserved, and that the style of the inside should perfectly correspond with that of the outside. Let every ornament be in perfect keeping with the general

style. Let the pulpit, or reading-desk, be rigidly pure in this respect; so that they may not appear for one instant out of place.

Let the walls and ceiling, if ornamented at all, be preservative of the one presiding idea—the union of each and all under one head—the unquestionable presence of unity of design.

INTERIOR COLORING.

WHITE, though the received emblem of purity, is, nevertheless, an injudicious color for the inside-wall face of churches. It is too glaring to the eye, besides being but too apt to display dirt; and therefore requiring constant renewal.

A slight admixture of coloring material, such as ochre, rose, umber, or terra-sienna, will give a pleasing tint, better suited to the place of solemn worship than gaudy white.

No accurate proportions need here be given; for, experiment can easily find the shade that pleases most.

THE CHOICE OF STYLE.

THIS is a question of moment to the community about to build; and one which should not be lightly treated. In it are involved the taste, permanency, comfort and economy of the church about to be erected.

Taste must, too often, be subservient to economy; but permanency never should be compromised to either. Taste and Economy may, nevertheless, go together, and permanency not lose one fraction of its rights. Here then is the desideratum: the very combination which men of sense and judgment will patiently look for with a worthy determination to find.

Straight lines, not admitting a single curve, in the design, may surely be considered as the most economical projection that can be formed.

To this the severe rules of architectural proportion may be strictly applied, and the result be a union of simple, yet harmonious parts in striking accordance with true taste.

Deviating from this extreme plainness or simplicity of style, our next step is cautiously taken, and we approach the curve, still preserving the integrity of taste by insuring a representation of unity throughout; and where the windows form into arches above, the belfry or other distinctive finish shall likewise present a similar curvature at top.

Again: advancing by degrees on our pathway, we steal, as it were, into the more ornate styles, and find that the simple semi-circular curve over windows, doors, and belfries, may borrow an additional grace by having their outline formed of distinct curves springing from four centers, and yet retaining their primitive unity of effect.

Pleased with success so far secured, we venture onward, and boldly point our pinnacles toward that Heaven the Christian seeks.

Our windows now partake of the form that governs the spire, the pinnacle, and the very roof itself. Two arcs of circles meeting at the top now crown the openings, and all is still true to the first principle, the ruling feature of the rest, unity of style, unity of idea, unity of effect—all is **UNITY**—and Taste has its unalloyed gratification.

It remains with the scientific mechanic to secure Permanency and Economy.

GRECIAN STYLE.

THE design we take first into consideration is the quiet-looking yet impressive Grecian elevation here presented. Not a line, save vertical or horizontal, is to be found in its unpretending outline and simple details.

It is strictly in accordance with the law of proportion; and the scrutinizing eye will therefore seek in vain for an impediment to rest upon. Great strength may be applied to its construction, or lightness of material be determined on: it will, in the one case as in the other, still bear the impressive appearance of stability derived from the very squareness of its nature.

Viewed in an economic light, it is, without comparison, the style to adopt. It does not require any extra skill on the part of the mechanic, and its appearance will be admirable in any locality, but most so in the quiet little village, whose neighboring woods still stand in witness of Nature's late dominion there.

SPECIFICATIONS.

This design may be erected in wood, brick, or stone.

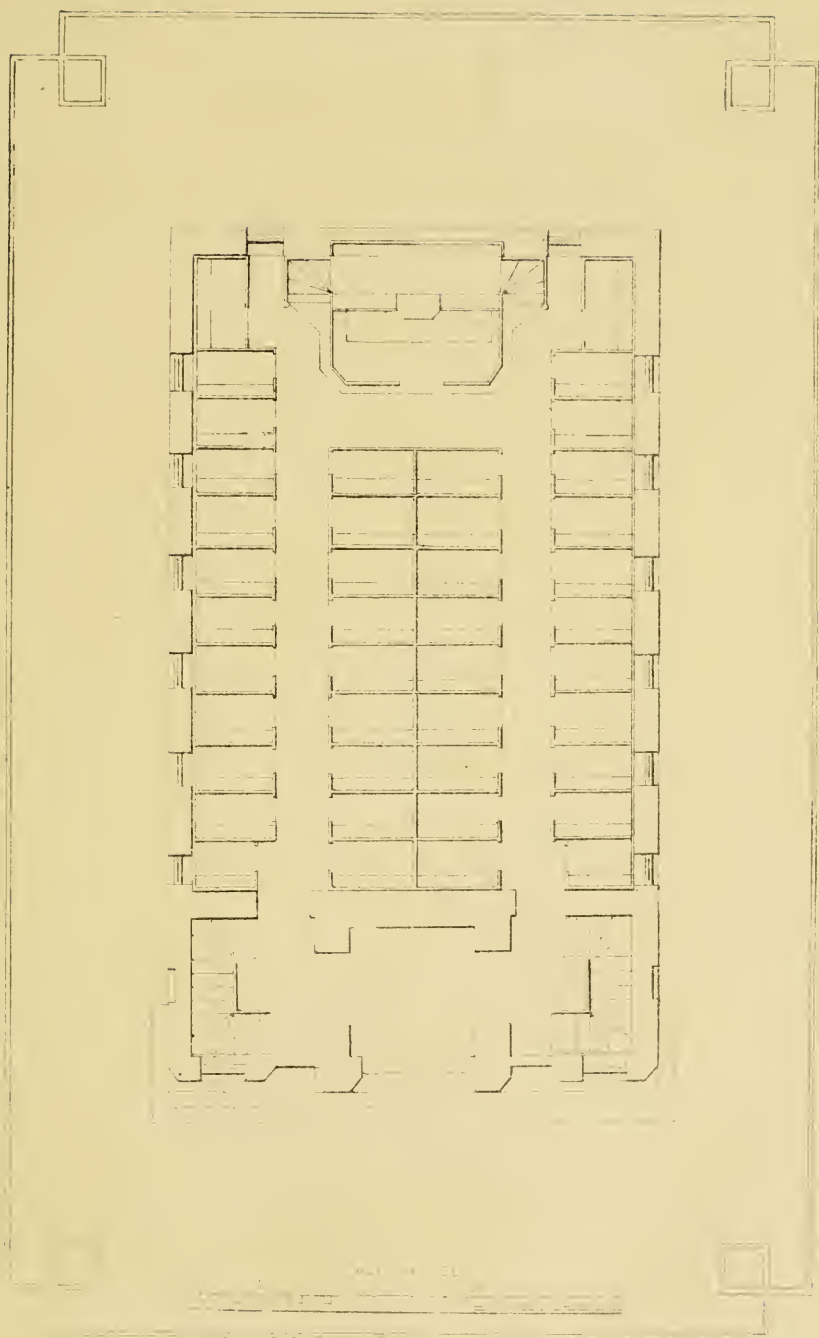
If in wood, and that material be cheap, it might be advisable to lay the walls *plank-on-flat*, as follows:

Having completed the foundation, and carried the base wall up some two feet above ground, decide where the





CHURCH A



entrance-door is to be ; and commence on its left side to lay the superstructure, plank after plank, all around the building, until you arrive at the right side of the entrance-door, from whence you set out.

Let those planks, in this and all succeeding courses, be ten inches wide, three inches thick, and be well seasoned and sound hemlock lumber.

Proceed on, course over course, taking care always to break joint by putting down *half-planks* at the commencement of alternate courses.

At every fourth course, stout oak pins should bind all together, say, five feet apart from each other.

When the level is attained at which the windows are to be located, let their respective places be accurately determined, and the frames be set up and secured. The planking will then be continued, as before: observing to have the ends which will form the window-jambs fairly matched, so as to form an even surface.

Throughout the progress of the laying, the plumb-rule should constantly test the work.

When the walls are finished, the next step is the laying of the ceiling-joists, which should be but sixteen inches apart from center to center: each joist to be three inches by ten or twelve inches, and go entirely across the building—every fourth one having a king-post, eight inches wide and three inches thick, firmly spiked to it. All those king-posts to range very truly at the center of the building. If thought necessary, struts might also be introduced between the king-posts and each wall.

The pole or ridge is now to be hafted down on these king-posts; and the rafters, six by three, are to be spiked home to this ridge, and also spiked at their feet to the wall.

The roof may now be carefully boarded with matched hemlock, two inches thick.

This roof might then be covered with sheets of brown paper dipped in boiling tar; and when completely covered, tar should be poured on over the whole surface, and lime in powder, or chalk, be sifted freely upon its surface. Sand may next be thickly distributed, until the appearance of the tar is not to be recognized. A grout of lime, sand, and hot water, may be thrown over the whole, and the roof is complete.

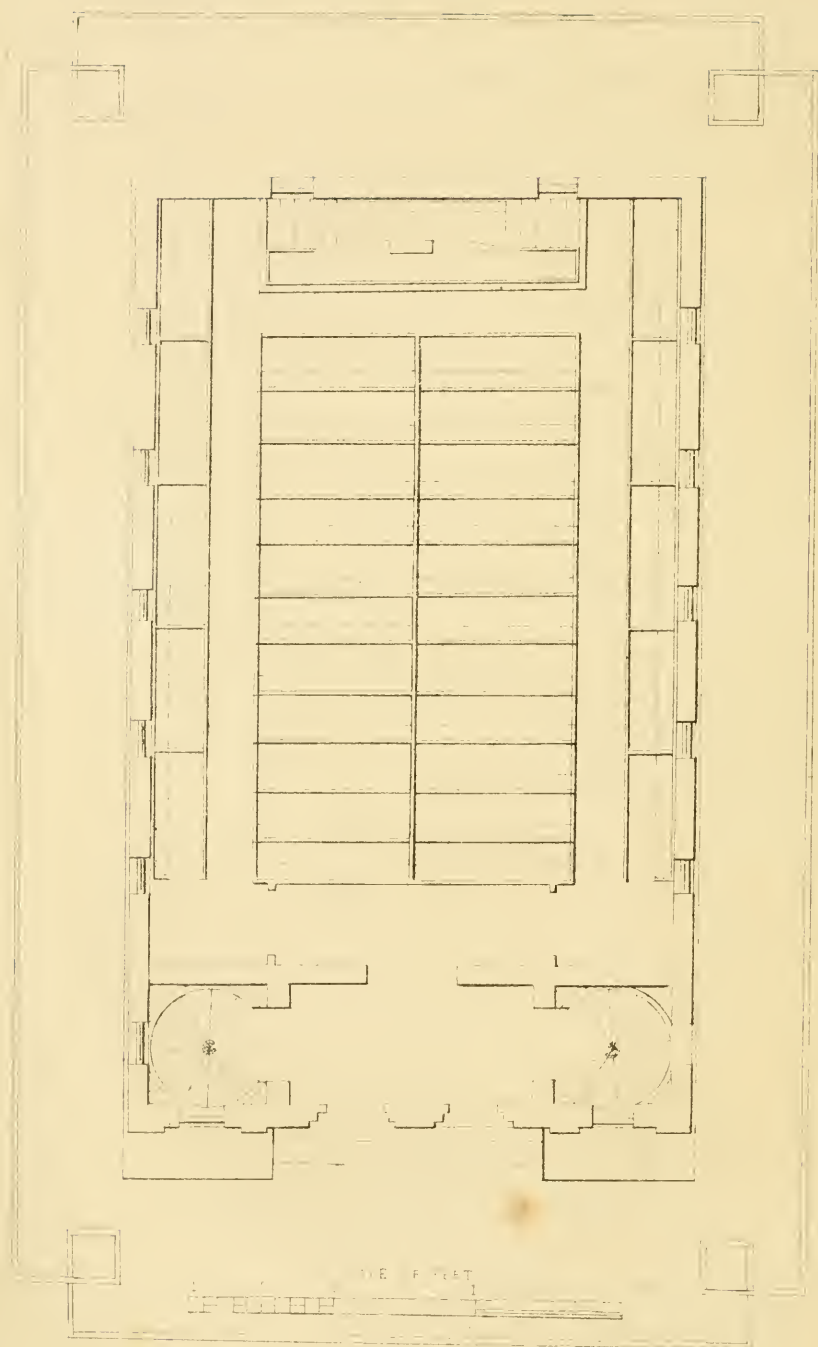
The interior finish must be in perfect keeping with the plainness of the exterior.

Adhering to the supposition that lumber is cheap in the locality, we will find sheeting or wainscoting desirable for the walls and ceiling. But in the use of such covering we can not too strongly urge the necessity for using *narrow breadths*, and tonguing and grooving.

This Church may have an organ-gallery over the entrance into aisle. It should be composed of a bressumer or beam running from wall to wall, twelve or fifteen feet advanced into the church, and about eight feet above the floor-line.

This beam may be supported at two points by plain, square columns.

A parallel beam to this should run at the back of gallery and the flooring-joists should be notched into both, and be twelve feet apart from center to center: floored above and ceiled beneath with nice, clean, sound pine.



ONE F. FEET

PLAN 10







Compton, Buffa

THE END OF THE

The front of this gallery should be square paneled, without any ornament.

The slips, or pews, should be stoutly framed, the backs to have a gentle inclination, being open below the seat: the seat to be closed in front. Thus a convenient place for hats, etc., is provided for each pew.

ROMANESQUE STYLE.

THE design here given is one of those which easily adapt themselves to the wants of a small congregation. The semi-circular heads to the windows give the leading feature, and add but slightly to the cost of the square window heads of the design which preceded it.

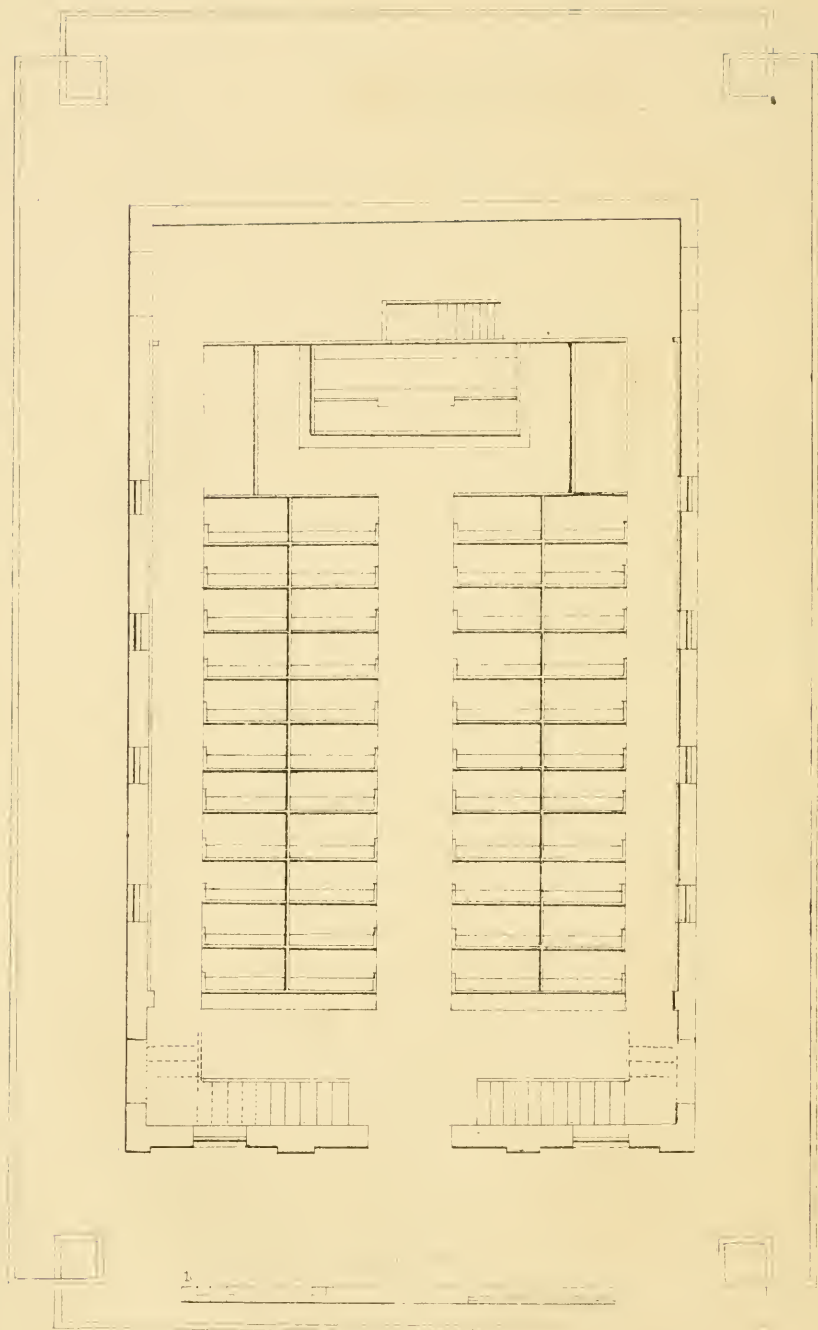
The glass of the side windows should be stained a light red or buff; and the effect thus produced would be pleasing in the extreme.

The ceiling should form a segment of a circle, to be perfectly in keeping with the exterior. The paneling of pews should likewise sustain the style by having circular heads. And, in fine, everywhere that the character of design can be denoted, it would be not alone proper but highly necessary to mark it unmistakably.

SPECIFICATIONS.

The design under consideration may be executed in wood, brick, or stone. We will suppose it to be required in *brick*.

The Foundation having been regularly staked out, and the trenches dug to a depth of five feet, with a breadth of two feet six inches, the concrete may be thrown in and rammed, going regularly around the trenches until all be filled to the surface of the ground.





CHURCH E

In making the concrete for this purpose, it would be well to put in a good proportion of water-lime, as it will then not alone be harder, but it will set the quicker—both being objects worthy of attainment.

And here we would observe, that the exclusion of common lime from concrete which is to be placed below ground is a very great mistake, as well on the score of perfection as of economy.

Water-lime in settling loses one-fifth of its bulk; so that where it and sand are alone used, the consequence must be a fracture in the composition.

Now, as common lime is well known to swell in slaking, does it not appear reasonable that the two limes possessing those opposite qualities might be so proportioned as to accommodate each other, and make a perfect bond for the silex or gravel?

To give such proportion here as might answer any or every locality would not be possible; because both water-lime and common lime are of very different degrees of strength in various places. The only way to become assured on this most important question is to try experiments on a small scale—say ten or twelve different proportions of about a peck each, and a just conclusion must be arrived at.

The Concrete should be made in a box, ten feet square and two feet high; and when well turned once or twice, it should, be shoveled in the trenches without delay, as, if good, it will set rapidly. Let it be spread in thin layers so that the moisture can have an opportunity of being absorbed readily.

The Foundations having been thus carried up to their full height, the next two feet and a half may be built of rubble masonry set in cement. This course should be two feet thick, projecting six inches on the inside to admit of the flooring joists resting on it.

The wall-plates may now be laid perfectly level, and the joists set on them. These flooring joists are to be twelve inches by three, and laid one foot apart from center to center.

The superstructure is now to be begun in courses of hard, well-burned brick, eighteen inches wide, in Flemish joint, working the front last. But care must be taken to insure a good bond at the junction of front and side walls, by building up the quoins as the work progresses.

And here let us advocate the economy and wisdom of leaving a space of two or three inches between the front and back layers of brick—in other words, building a *hollow wall*. The arguments in its favor are many; but the chief is the saving of furring and lathing—the plastering being put on to the wall. And as no damp can by any possibility strike through, there is no objection to such a course.

Should the *hollow-wall* system be adopted, it will be highly necessary to have bonds occur as often as possible.

The front must be carefully erected, in conformity with the elevation, the shadows on which mark the required projections and depressions, as they are cast to an angle of 45° .

The Roof should be a simple truss; the angles at each wall to be ribbed, so as to form with the ceiling-joists a graceful curve.

The timbers of each truss should be,

Tie Beam,.....	12 by 8
King-Post,.....	8 by 4
Principal Rafter,.....	6 by 4
Struts,.....	5 by 4

These timbers should be judiciously ironed and permanently secured, forming well-framed trusses. Each to be ten feet apart from its neighboring truss.

Purlins, or horizontal timbers 4 by 5, are to be laid midway from ridge to eaves. One may be sufficient on each side, provided the roof covering is not of very heavy material—such as slate, tile, iron.

The roof may now be sheeted over with inch boarding, accurately matched, and the covering, whatever it may be, laid.

Well-burned, glazed *tiles* would make a very suitable roofing material for a design like this, if potter's earth was to be found in sufficient quantities in the neighborhood to warrant its use.

The *tiles* should be moulded in a corrugated form, so as to effectually cover joints, and they should likewise have a thick coat of glaze on their outside, produced by salt or other material; be well burned, and equal to a certain resistance of the frost and the heat.

Slate is an excellent covering for churches, and it is now coming into very general use in this country, particularly on buildings erected under the direct control of the govern-

ment departments: it having been ascertained that this climate is not, as was supposed, invidious to that article.

Iron corrugated plates come next in succession of desirable roofing materials; but they should be galvanized, to avoid the ruinous effects of oxydation.

Tin has an advantage over iron in its lightness, and consequently not requiring so heavy a frame of roof. But tin is perishable by oxydation.

Zinc answers the same purpose as tin, being objectionable, however, from the fact that it will become liable to minute pores, which can not be very easily guarded against; and, moreover, there is not yet known any effective composition of solder to use with it, where joints require closing.

Shingles are the lightest, as well as the cheapest (at least for a limited time) material yet found. But they are very dangerous, as being so combustible. This latter objection might be remedied by dipping each shingle into a solution of potash and salt, previous to using.

The receipt given in the preceding specification for a composition roof, is well adapted to all buildings; and, although costing somewhat more than shingles, is yet more economical, from the fact of its extreme durability.

This subject of covering for roofs of churches is well worthy of serious consideration, as it is, after all, the one which truly defends all others from the effects of time and climate.

The ridge of the roof should be protected by a course of saddle-tiles to cover the meeting line of the opposite and uppermost courses. These should be well bedded in cement, and made perfectly secure, as the crowning of the roof.

VENTILATORS. In each gable there should be an ope or aperture through which the air may find access to the timbers of the roof, and the exhalation from the ventilators in the ceiling be permitted to escape.

The ceiling should have a sufficient number of ventilators to keep the atmosphere of the church pure, even when a congregation fills the building to its utmost capacity. In the same manner the admission of pure air should be attended to. The registered pipes or conductors for this purpose should open in the church at about four feet from the floor-line, and the sill of each window would be a very proper place to insert them. By this arrangement, the extremities of the person will not be made cold, while the admission of pure air drives off the breath exhaled.

HEATING. As we have in a previous part of this work spoken of the necessity for having a church heated from beneath the flooring, we will now only specify the most proper mode of executing the necessary work.

THE HYPOCAUST. This generator of heat, which is no other than a basement furnace under a Greek title, is perhaps the best of all agents for transmitting heat to a Church. It is formed much on the plan of a baker's oven, with the addition of a metal chamber for hot-air in the center of it. From this latter the heated air is carried to the building in pipes diversely directed so as to send a supply above to every part.

As hot air expands wonderfully, it will be necessary to have the cold air pipe which shall supply this chamber proportionately small.

Where the hot-air pipes are to enter the floor of the Church, a square flag pierced in the middle is to be set, with a register to regulate the supply of heat required.

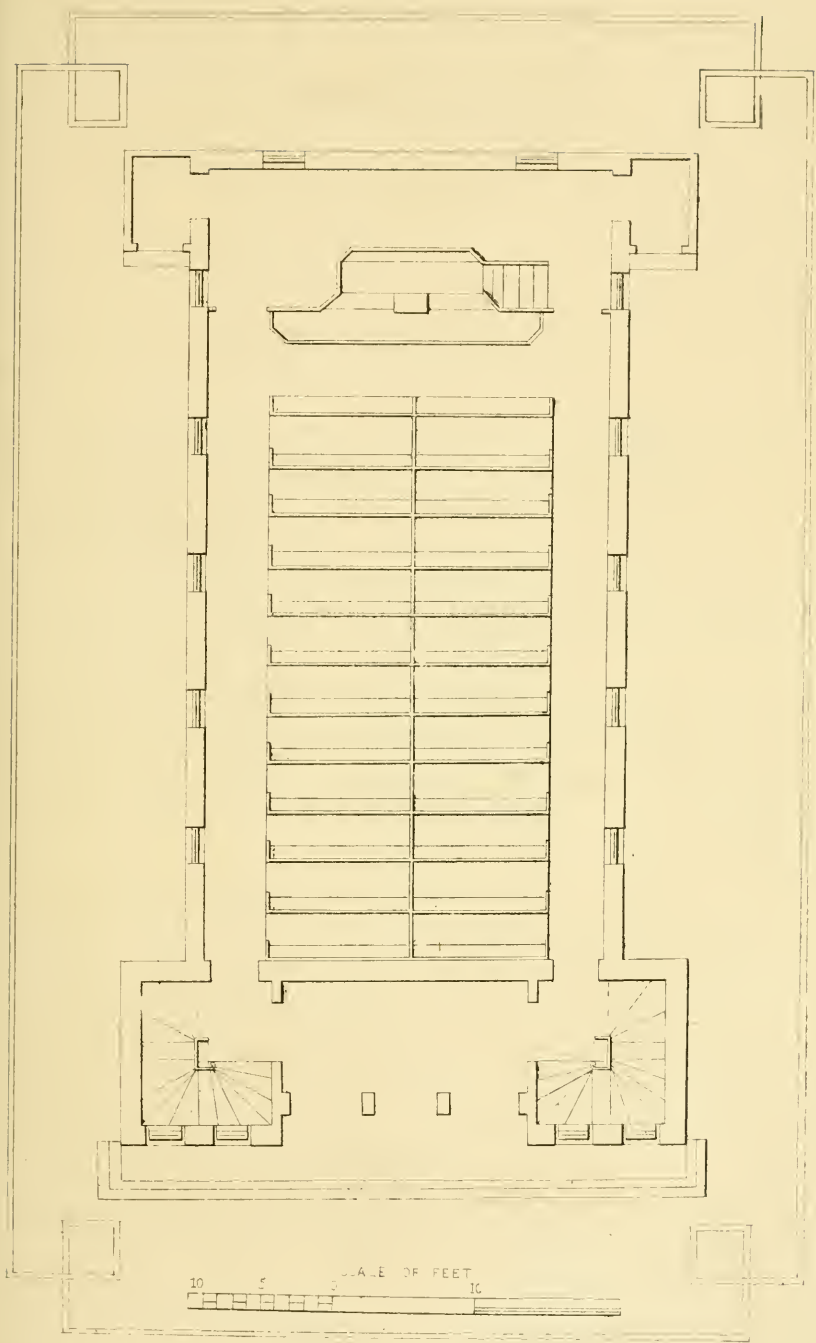
A hot-air pipe should be conducted to the pulpit, having a register for the comfort of the officiating clergyman.

Provision should be made in the building of the end or gable wall to carry up a flue 8 by 16 inches, to convey away the smoke from the hypocaust.



CHURCH B.





PLAN, R

PRIMITIVE GOTHIC STYLE.

THE accompanying illustration is in some respects most desirable for a congregation whose means are small. A very great advantage will be found in the facility of egress through the doorways.

On the whole this design commends itself to favor by its simplicity of effect, and absence of any thing which might entail expenditure.

The roof is what is termed *hammer beam*, and, well constructed, must produce a pleasing feeling in the observer.

The walls may be executed in any material; but probably rubble masonry would be the most suitable.

SPECIFICATION.

The foundations are to be laid as before stated for the preceding designs, or to be built of rubble masonry. In the latter case it would be well to make a grout of coarse sand, water-lime, and common lime, and pour it on over each course of dry masonry. The grout must be moderately thick. The corner-stone and basement are to be laid in cement, to about twenty inches above ground.

A bare course of hammered stone, 8 inches deep on the face, is now to be set around the building, projecting two

and a half inches beyond the face of the basement, and slightly chamfered on its upper edge.

The superstructure may be eighteen inches thick.

The sills and caps of windows and doors to be hammer-dressed the same as the base-course.

The windows on sides are to have Gothic heads, similar to those of the upper section of front elevation.

The roof is to be composed of sections ten feet apart from each other. These sections are formed of one-inch plank spiked together in layers when cut into shape. All these are to be nine inches thick, and of the other dimensions shown on the section.

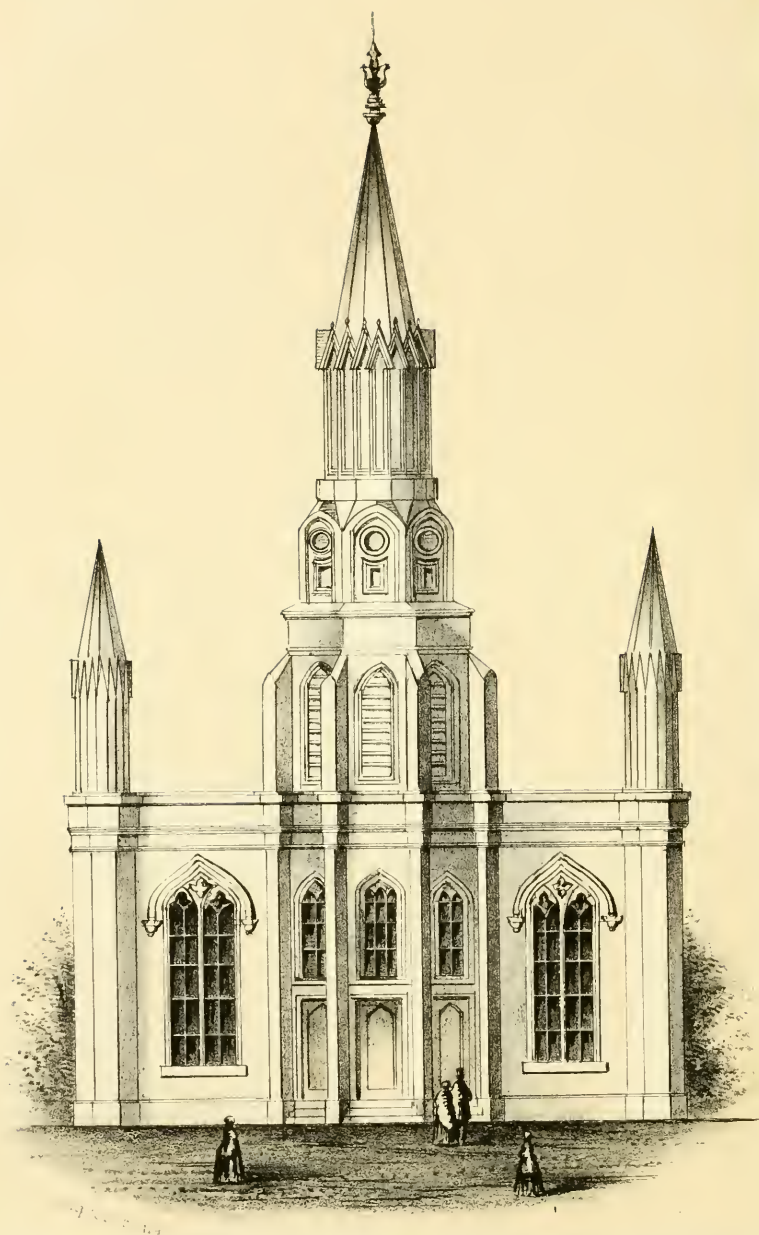
The first pattern being cut out, there is no trouble in multiplying the forms until the necessary thicknesses are obtained. The rafters are to be eighteen inches apart from center to center.

The boarding of this roof is to be planed on the underside, matched, grooved, and tongued.

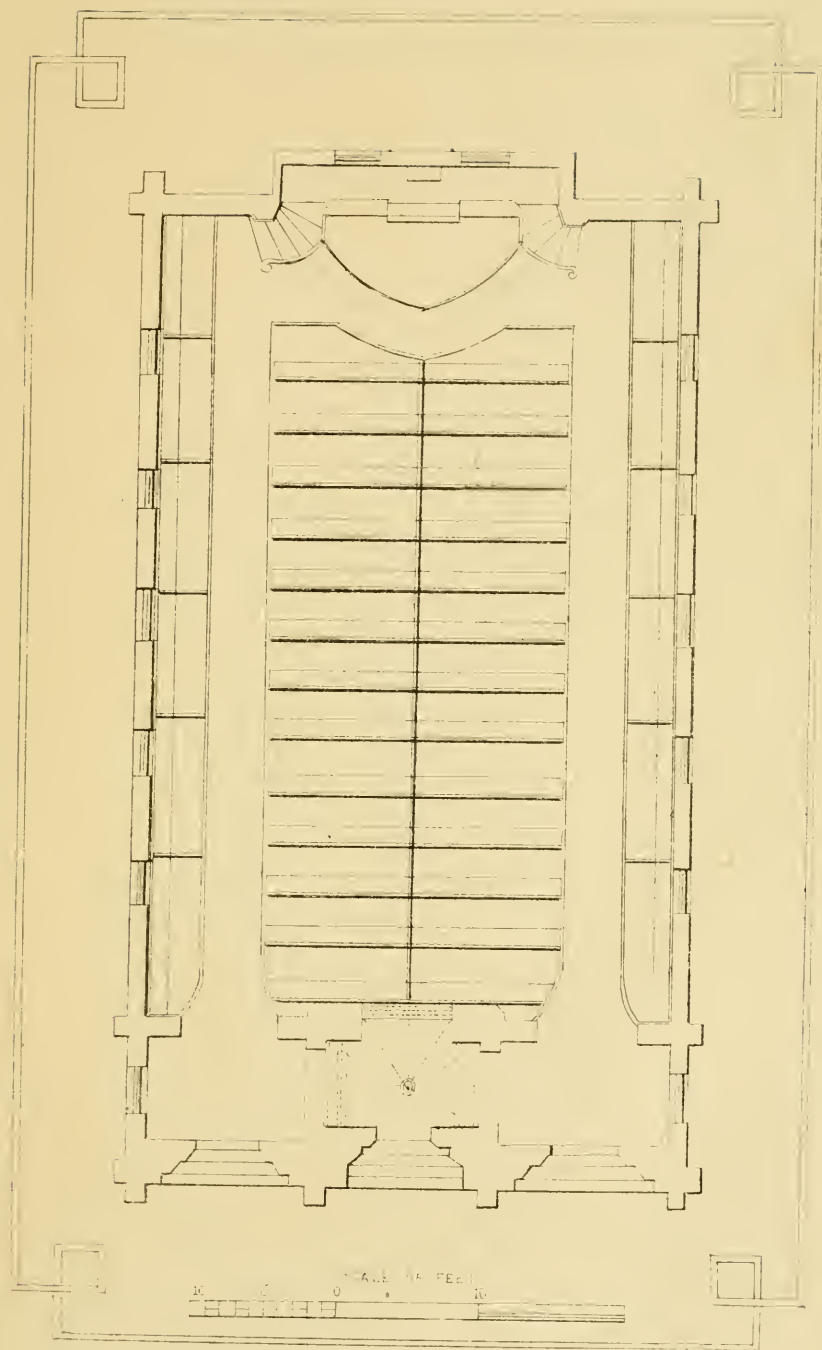
When the joinery work is completed, the principals, rafters, and roof-boarding, are all to be painted two coats, and finished with oak color.

The window and sash frames, the pulpit and pews, and in fine, all the joinery in the church, to be painted the same color. The pulpit, pews, and doors, are to be grained.

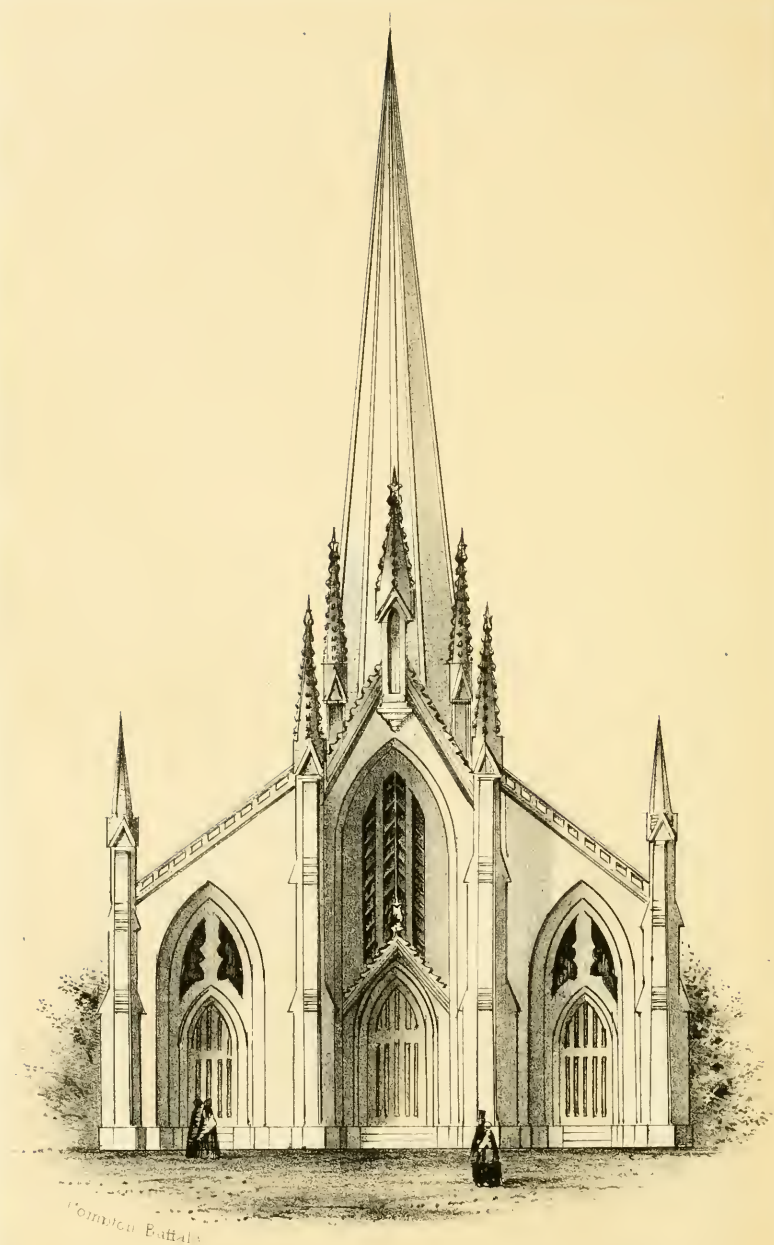




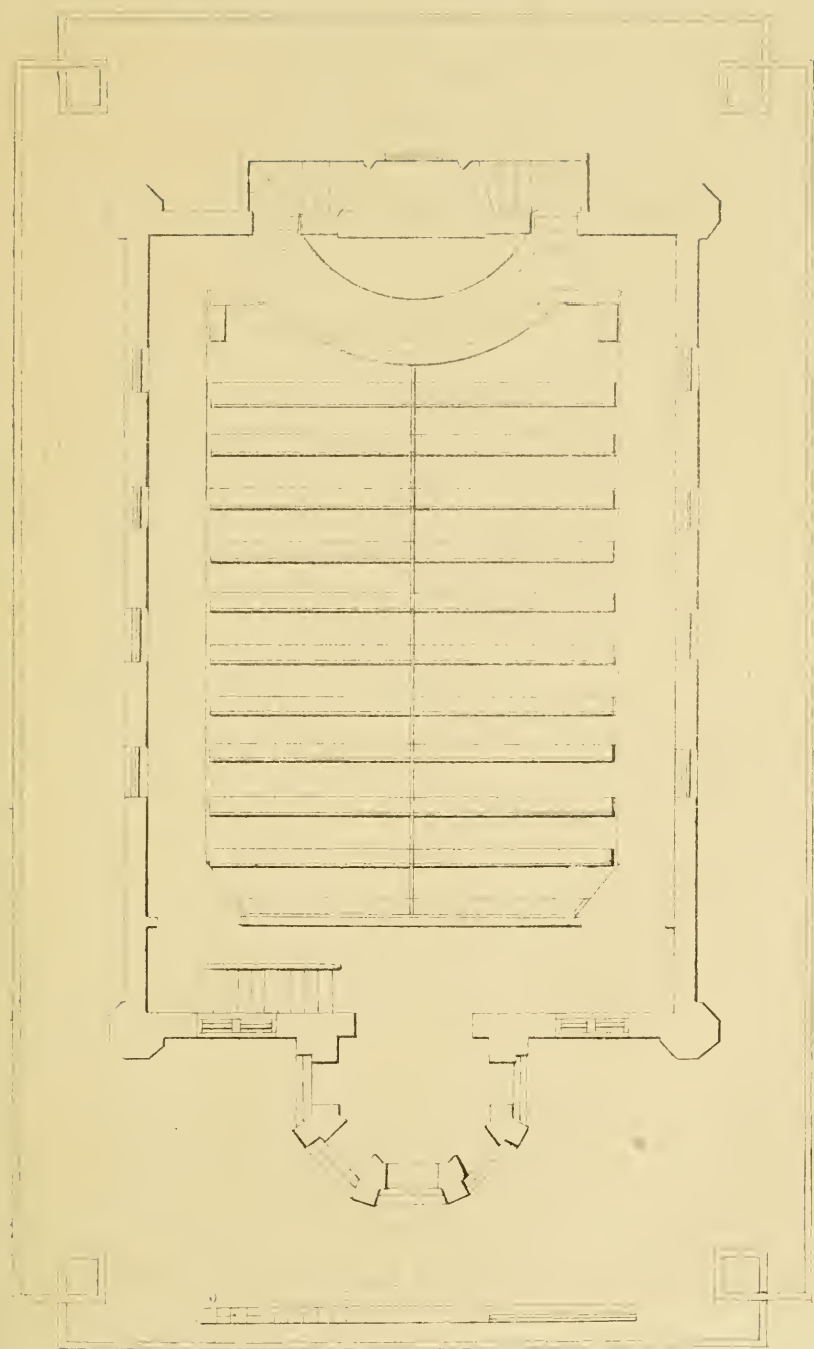
CHURCH H



PLAN H



CHURCH G.



PLAN

POINTED STYLE.

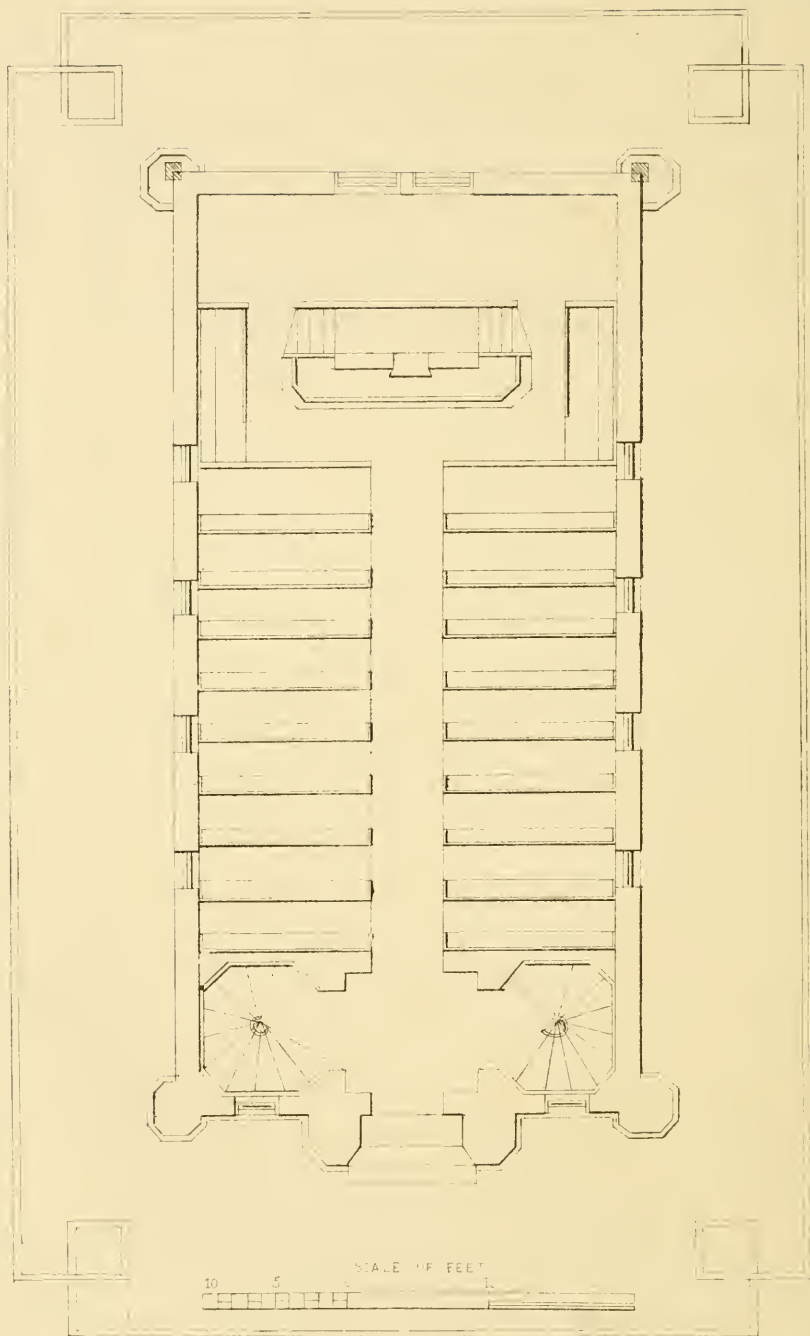
WE have given several illustrations of this truly ecclesiastic style of Architecture; and must leave to the taste or peculiar requirements of our readers to select from them as their judgment may dictate.

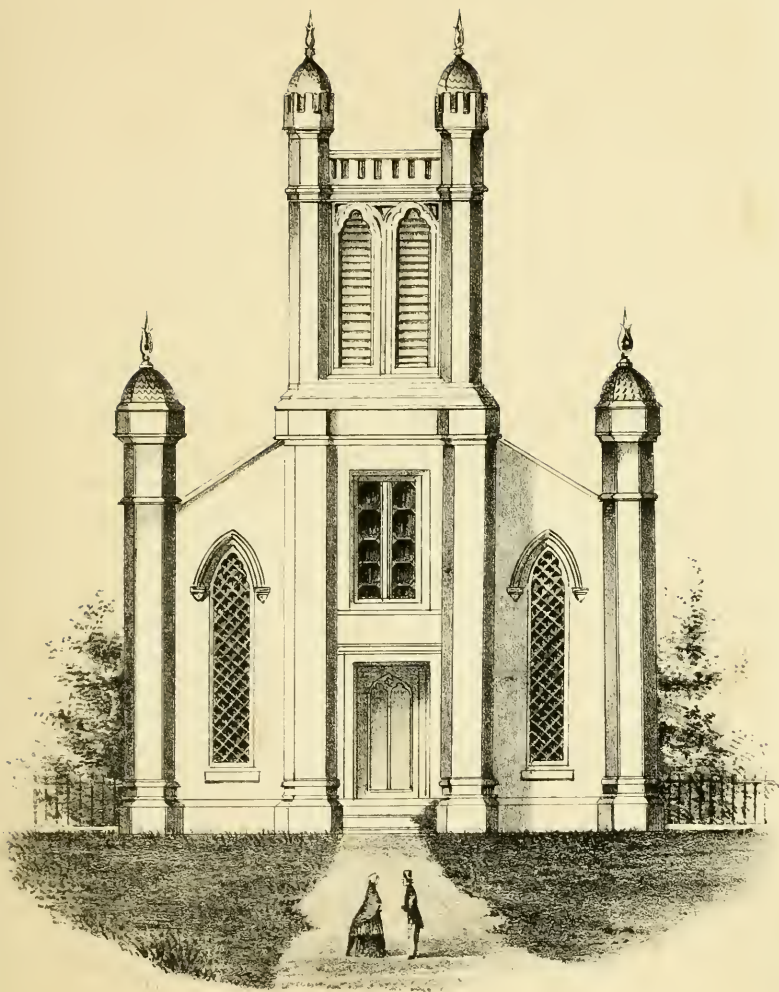
Any one of them would look well in a smart village; and, none of them would cost extravagantly for the erection, unless indeed cut stone might be chosen as the material. Brick-work well cemented, and having the hoods, molding, and various details of ornamentation executed in cast iron, would present a very desirable appearance; at the same time being economical, from the fact that our foundries now keep such castings on hand, there being a constant requisition for them.

The specification already given will answer for each of the designs, as any intelligent builder (and to such alone should the contract be given,) will easily form an opinion as to the necessary work to be done in erecting it.

As these designs are made to an accurate scale of parts, there can be very little trouble encountered in finding the "quantities" of material or workmanship in their execution. In order, however, to assist the judgment of the mechanic in making his estimate, we have given the calculations at

the end of this book. To those quantities there laid down, the builder need only put the price of his local market. The labor he can best judge of himself, as some mechanics will do half again as much work in a stated time as others: add to which the difficulty of deciding on an average of wages for the length and breadth of this country.



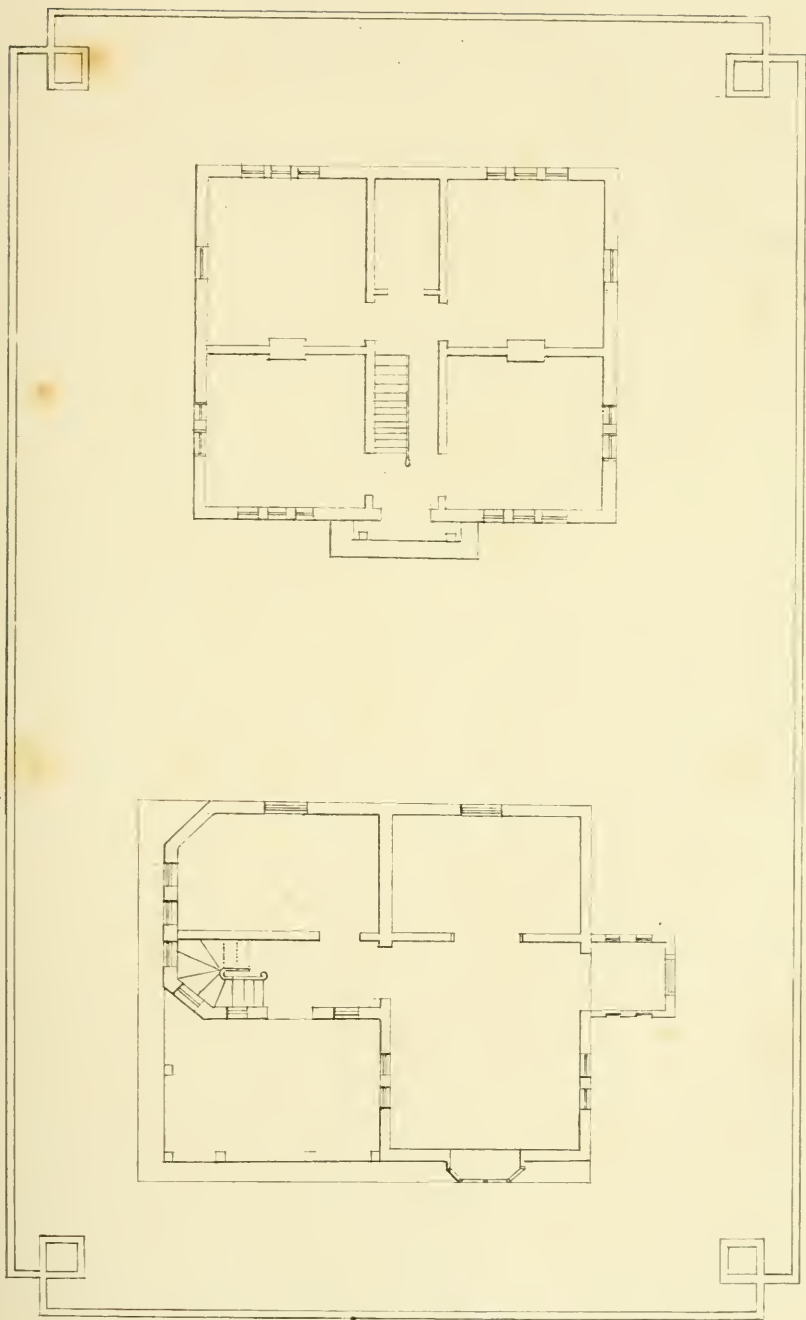


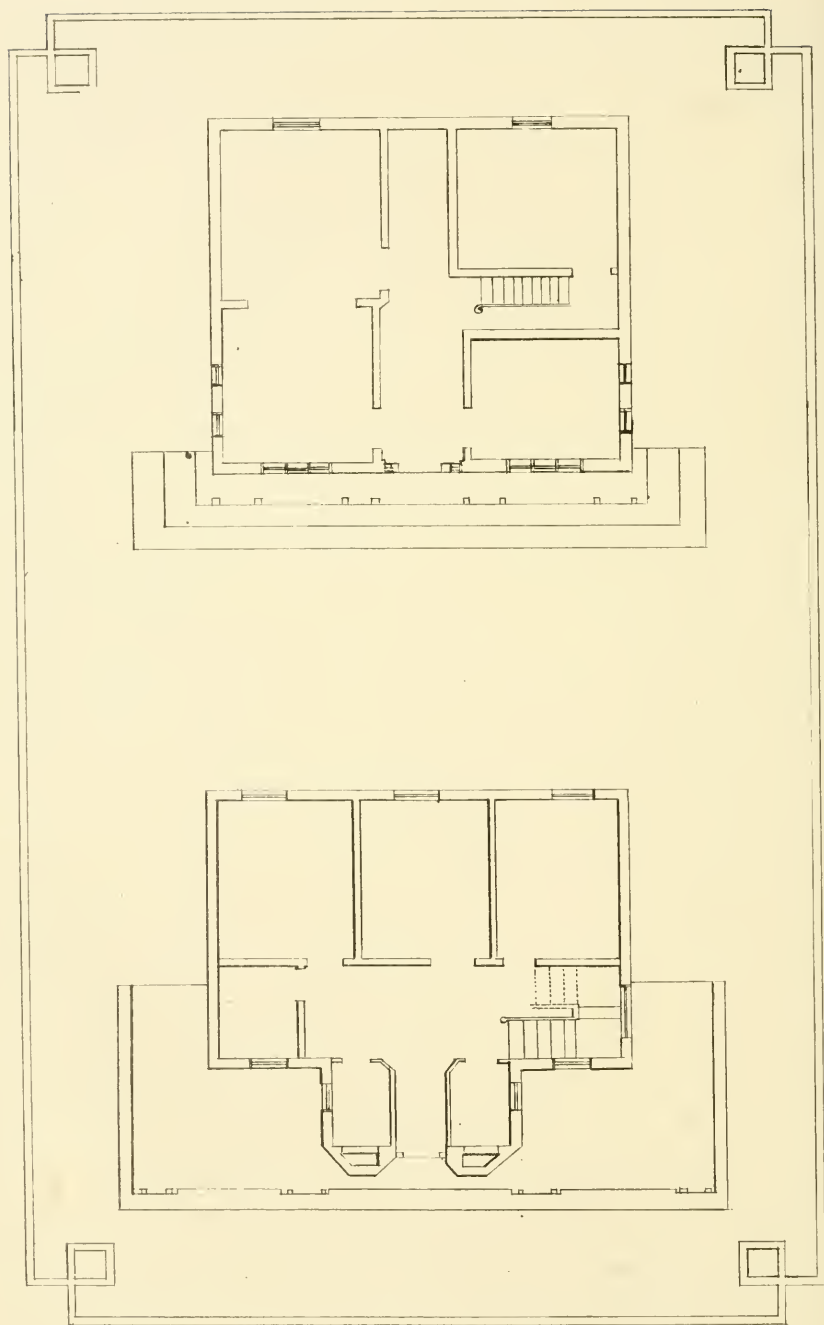
CHURCH C

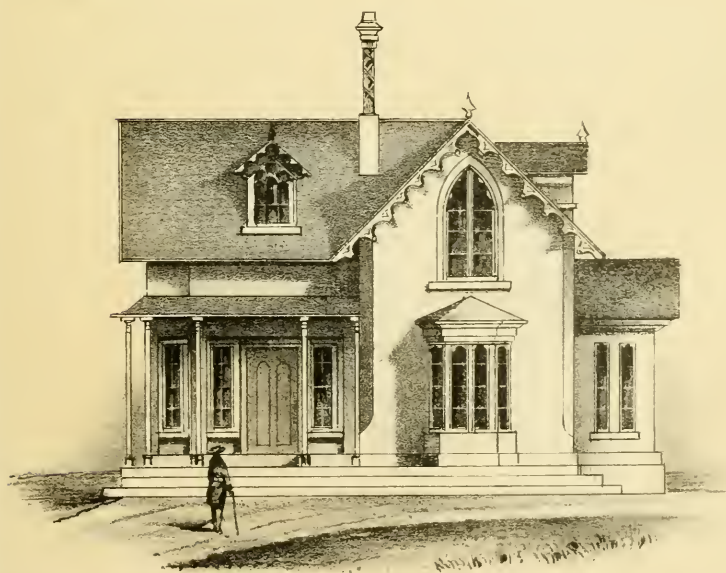


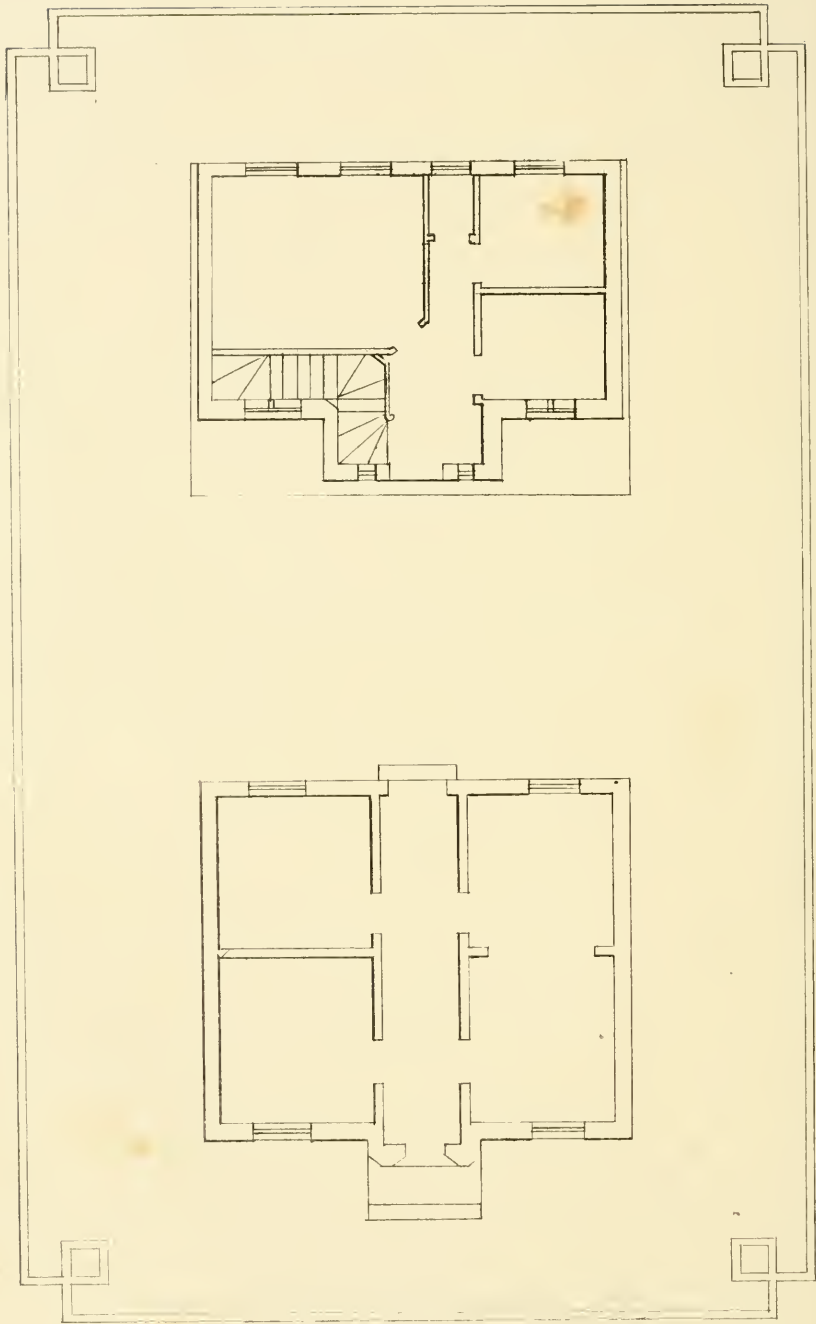




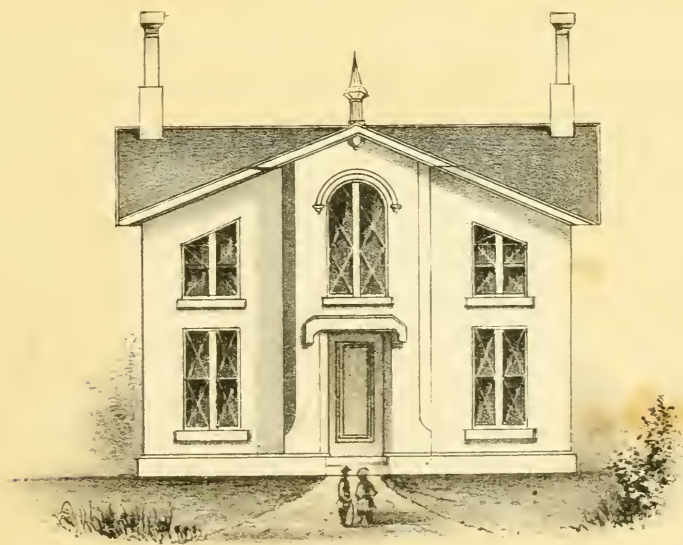
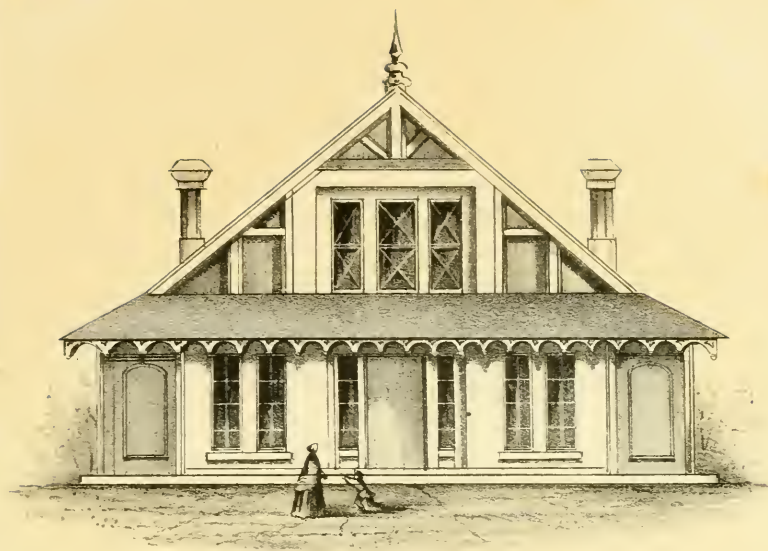


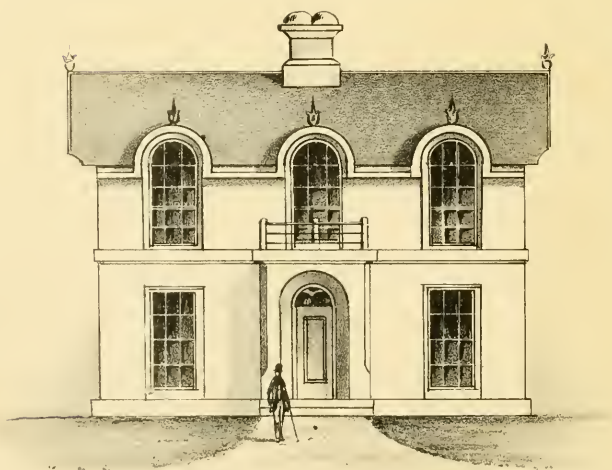
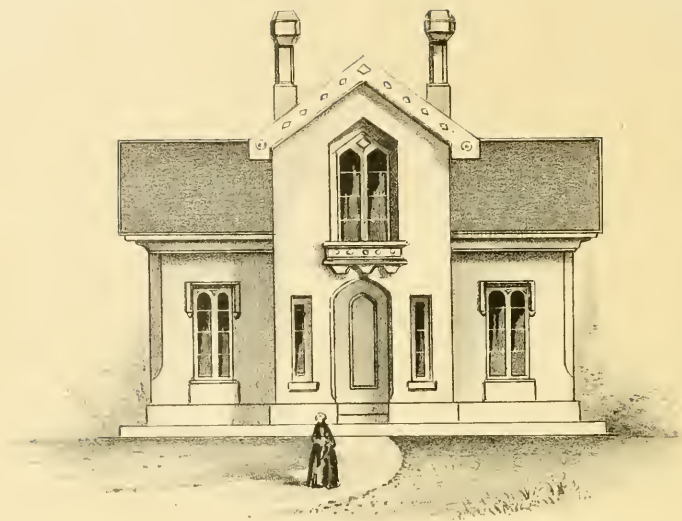




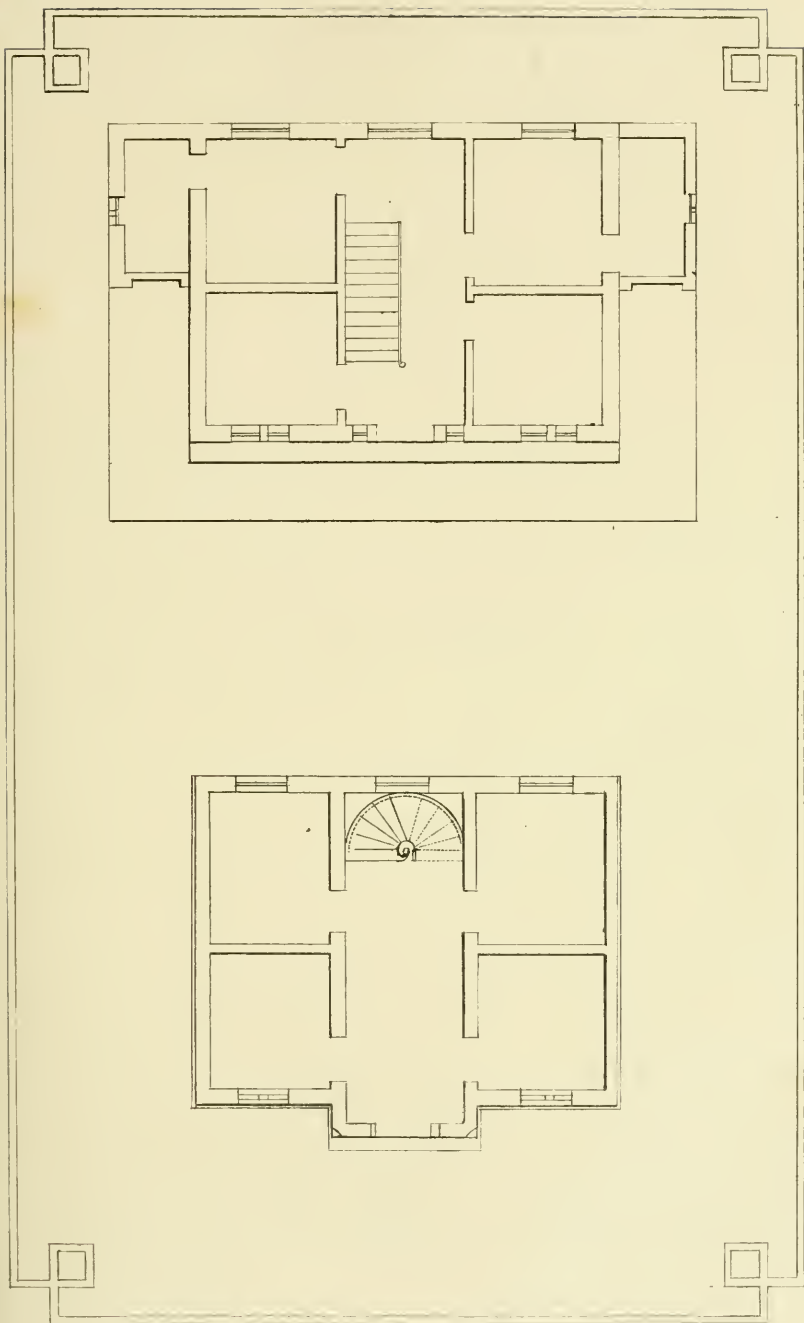














PARSONAGES.

It is the very natural desire of a religious community to whom their good Minister is endeared by his heavenly labors, that he at least should be well cared for, and that the elegant appearance of the church should not rebuke the neglect of the home of its pastor.

Next, then, in consideration to the CHURCH should come the PARSONAGE; and it would seem reasonable that the style of architecture should be the same in these kindred designs. They should be, if possible, near to each other, and a certain unity exist between them, so that the stranger shall have no difficulty in noting the one any more than the other; but, in speaking of the Church, be also able to tell where

“The village Preacher's modest mansion rose.”

The Parsonage should stand on or near to the church lot; and no church can convey a perfect idea to the mind of its completeness where the dwelling of the clergyman is not near it; or, as is too often the case in our country villages, is altogether remote from it. There is an unaccountable dreariness in the sight, akin to the feeling produced by the appearance of a tenantless palace, or a noble fortification without a sentinel within hail—a ward without a warder.

No: such should not be the case. The man of prayer should be close to the house of prayer. His eye should be on his master's mansion; and the same flowers that bedecked his own parterre should lend their fragrance and their beauty to the surrounding of the holy temple of his care and love.

GENERAL SPECIFICATION.

THE dimensions of the plans herewith given are alike in all respects ; and therefore one specification will be sufficient for all. Thus, the foundations, if of concrete, will be alike in proportions. If of stone, the same directions answer ; and so on through all the various parts of the construction.

CELLAR BASEMENTS.

For the same reasons which we have already given in the *Economic Cottage Builder*, we now strongly oppose the use of basements for dwelling purposes. It is true that they are very useful, and certainly secure a very great economy of space. But, in case they are required, the following cautions must be strictly observed : the floor over the cellar must be made close and thoroughly impervious to the escape of any air from below. No trap or opening should be allowed within doors. The bottom of the cellar should be overlaid with cement of such quality as to be perfectly resistant of wet, and at the same time durable. Ventilating flues should be provided for the use of such basement cellars, that they may be kept as pure as possible. But, on no account should vegetable matter be stored in them : such a practice proving invariably prejudicial to health.

Basement walls, from the foundation up, should be well

laid in cement, as much if not all of the damp in upper walls of houses is attributable entirely to this fact: that the wet penetrating the basement wall is by capillary attraction drawn upward, and finds its way at once into the plaster, if the walls be not studded, and if they are studded, the studs themselves will in due course of time decay and ruin the plaster.

In laying the flooring joists, it would be well to board the under side, and fill in with saw-dust of cedar, before laying down the flooring boards.

The flooring boarding should be sound, free from knots, shakes, and other defects; and the whole floor be laid in narrow breadths, (not exceeding seven inches,) tongued and grooved.

Thus will a perfect floor be formed through which the scouring-water can not find its way; and one in every other respect superior to those floors which are laid with a view to their being hidden by covering of carpet, or oil-cloth.

And here we would observe that, as Parsonages are intended to be durable structures, they are necessarily to be built of as sound materials, and in as workmanlike a manner as the church itself.

In fact, this appendage of the church should be constructed of the same material. Thus, if the Church be of stone, brick, or wood, of such let the Parsonage also be built.

In the following pages, we will treat of the construction in each material.

CONSTRUCTED IN WOOD.

WE will now take any of the accompanying designs for Parsonages, and treat of it as supposed to built be solely of wood.

The foundations are to be formed, digging holes two feet square, and one foot and a half deep, at equal distances from each other; say five feet apart, all around the main wall's plan, as marked out upon the ground previously, and truly squared.

In the center of each of these holes, drive down cedar posts sharpened at their lower end, and charred over a fire. These may be driven five feet deep, from the surface line of the ground. Each post to be not less than eight inches in diameter.

All the cedar posts being driven down to their allotted depth, the level of the whole is to be next ascertained by means of a true spirit or water level, and the tops of the posts squared in accordance with the line thus obtained.

The main sill of the house may now be placed on the foundation posts, boring it directly over the center of each, and driving down a stout, well-seasoned oak pin, eighteen inches long, and two inches square.

This sill may be 10 by 12, or even 8 by 10, but it is desirable to choose the former dimensions, as the strength of the

building is governed, in a very great measure, by the capability of this first and principal member of the construction.

The framed sill being now securely pinned down and leveled, the next operation is to fill up the square holes with concrete, tightly packed, and all is complete, as far as the foundation is concerned.

In case a cellar is required under the house, it will be necessary to have it in the rear, raising the floor immediately over it some two or three feet; leaving four feet below the level of the ground, or perhaps four feet six inches, so as to obtain a cellar of over six feet high. Where this cellar is located, the cedar posts of foundation should be double boarded with two inch hemlock, from post to post, and the space between filled in with tan-bark, sand, or any fitting material which can be conveniently procured.

The door of such cellar should, for reasons already given, be on the outside of the main building, as, for instance, in the woodshed.

There should be a window provided for it, and as much means of ventilation secured as possible.

But here, as in the work on "Cottage Building," we would most strongly urge the far more healthful plan of building out-of-door cellars — distinct structures, neighboring to, and, perhaps, attached by a covered passage to the Parsonage. Such may be constructed of hemlock plank, surrounded by a solid embankment of earth; or, it may be built altogether of sun-dried brick, composed of moistened earth, with straw, or hay, worked into it, and cast in a mold formed like a box, without top or bottom. Each

of these bricks to be 18 in. by 12 in. by 6 in., and left in the air to harden, for two or three weeks.

Or, the cellar may be built of the same material as that just mentioned, piled up into one solid wall, without molding into bricks, and be afterward faced, by cutting, or raking down and going over it, inside and out, with a smooth board, or a plasterer's float.

The flooring joists of Parsonages, for the first, or principal floor, should be 10 in. by $2\frac{1}{2}$ in., and placed at twelve inches from center to center. They should be sound, perfectly free from sap, shakes, or defects prejudicial to their strength or durability.

The joists in wooden buildings should always be long enough to admit of the boarding outside being nailed to their ends; for which purpose, those ends should be carefully squared.

The flooring-boarding should be loosely laid, bottom side up, until the plastering of ceilings and walls is finished, setting down and nailing only the boards next to walls. This precaution will save a great deal of future trouble. But the plastering must be perfectly hard before the final hammering down of the flooring-boards shall take place. And here it would be in place to remark, that screws instead of nails would be a great improvement in floor laying; inserting a screw at, say, every third or fourth joist, and instead of keeping one straight line, let the screw-heads form diagonal lines, along the floor. Thus, hammering will be avoided, and the floor be fully strong enough, at a trifling extra cost over that of nails.

Here, it may also be observed, that the skirting, or wash-board, should be nailed on before the flooring boards are laid, so that the latter may be tongued into it; thus avoiding the too constantly appearing bad consequences of shrinkage of the skirting, where it rests upon the floor; and the admission of cold air, insects, etc., through the gap.

The flooring boards should not be less than an inch and a quarter thick, when finished. They should invariably be tongued and grooved, free from knots, shakes, sap, or splits.

The boards for walls should be planed on the outside. They should be $1\frac{1}{2}$ inch thick, well seasoned, sound pine lumber, similar to the flooring just spoken of; well matched, tongued and grooved.

The grooves are to receive a coat of white-lead before the tongues enter them. When joined and nailed home, the joints are to receive a coat of white-lead, and the battens or slips to be set over them, while this coat is moist. The joints will thus be perfectly free from the chance intrusion of damp or air.

These battens, slips, or slats, should be one inch and a half thick, the same as the boarding, and may, in fact, be such boards sawed up into breadths of two and a half inches.

Now we have arrived at a question which must be decided by the reader. Which does he choose: independent studs for the inside plastering, or letting the battening of the joists inside act as studs for the same purpose? The former is, of course, the more expensive; but it is the strongest by far, and the most reliable for a house of more than one story.

By adopting it, there will be a necessity for a frame; the upright timbers of which must be similar in width to the ribs and caps.

The door and window jambs must, likewise, be wide enough to clear the studs for lathing, which are to be nailed on to those ribs and caps.

The quoins, or corner posts, must be square-grooved on their inside angle, so as to take the lathings.

The cheaper method is, simply to counter cover the joints of siding or boarding with studs, which shall take the lathing—the corners having a double stud, square grooved, as in the former case. The windows and doors should likewise have double studs, in order to strengthen the construction, as well as to give the appearance of solidity.

Such windows and doors should have broad facings—say 4 inches broad—on the outside. On these, fancy ornamental buttons, turned for that purpose, may be spiked. Such facing need not protrude beyond the wall more than the thickness of the neighboring battens.

The angles of the battens should be beveled off; and, in some cases, the facings may be so treated with good effect.

The caps and sills of windows and doors should have grooves for the passage of rain-water on their under surface, to prevent the access of wet to the building, by causing a drip.

In the putting on of the roof, it would be well to haft the rafters down on the ends of the boards, or planks, thus: where the rafter meets the wall, cut or notch a sufficient piece out of the rafter, of the same width as the thickness of the plank—that is, $1\frac{1}{2}$ inches.

These rafters should be five inches by three, or two and a half. They should be notched into each other at the top, and be securely spiked. One foot six inches from center to center should be their position.

When the rafters are duly laid, they should be very carefully boarded with hemlock boards, half or three-quarter inch thick, matched, and free from holes or fractures.

The roofing cover may be of shingle, tin, or tarred paper. The latter will be found a very good description of cover for a light roof, such as this mode of building actually demands. It is more permanent than either tin or shingles, without being as costly.

We have already described the method of making and putting on the composition, and would here strongly recommend its use, more particularly in case the Church to which this Parsonage belongs is covered with the same.

The chimney in a wooden house must be of brick, with a stone foundation, if fireplaces are called for.

In case stoves alone are used, it will only be necessary to erect a shaft which may be sustained by the flooring-joists, or in some cases, by upright pieces of seasoned oak. In the latter case, the space thus included might be inclosed, and made to answer for lockers or cupboards.

It would be very desirable to have two-coat work and hard-finish for the plastering of both walls and ceilings, as the unavoidable jars which this class of dwellings is liable to, can not be too well guarded against.

The glass used in windows should be the best double-cylinder, free from all blemishes. Weak, imperfect glass, is anything but an article of economy.

The window-sashes into which it is set should be well made, close jointed, and of the most unexceptionable seasoned stuff.

The doors should be all four-paneled, inch and a half thick, set upon strong butt hinges, and have handsome ball furniture for the principal rooms, and iron thumb-latches and bolts for all other apartments.

The walls, if to be painted, should first be allowed to dry, and then receive a coat of oil priming, on which, when dry, the color coat is to be evenly laid, and the whole surface gone over with a blender.

In case fresco is thought sufficient, it is only necessary to dissolve glue or size in the required quantity of water, and when it is moderately adhesive, pour in the chosen color in dry powder, taking care not to use white-lead for white, but whiting.

CONSTRUCTION IN STONE.

THE Church being built in stone, it would be very desirable to construct the Parsonage in the like material. In such case, the outer dimensions shown on plan must be enlarged sufficiently to admit of the increased width of walls.

The foundations must be sunk to a sufficient depth to insure stability for the superstructure, and to guard against the possibility of settlement hereafter.

These foundations, together with the basement walls on them, should be laid in cement, and be well bonded.

If a basement cellar be required, the floor of it should not be below the surface, or main level of ground, more than two feet six inches.

The floor of this basement cellar should be formed of composition, at least four inches thick, made of water-lime, sand and gravel, in proportions of one of water-lime, two of sand, and three of gravel, evenly laid on and left to harden.

The walls of the cellar may likewise be plastered inside with water-lime.

The superstructure should be built of sound rubble masonry, well bonded and cemented together with stiff mortar, made of common-lime and sand well slaked, soured,

and worked up together in such quantities only as may be required for immediate use.

Wall-timbers should be inserted where wanted to take the furring for lath and plastering.

The openings for windows and doors should have brick trimmer-arches turned over them; and the flues and shafts of chimneys should be formed of brick also.

A substantial wall-plate, 6 by 4, should be laid upon the walls, and be securely framed at angles. The principal rafters may be notched on to this wall-plate, and spiked down.

In all other respects, the work on a stone structure is similar to that on a wooden one.

It would be highly necessary to fir out the wall for plastering, as lime-stone walls are very apt to be damp.

CONSTRUCTION IN BRICK.

THIS excellent material is always desirable where it can be procured at a moderate expense. It has an advantage over rubble masonry in the facility with which square moldings and other simple ornaments, as well as pilasters, may be introduced without any extra charge on the general estimate.

Brick, when sound, is the most acceptable of materials for dwellings. To be good it is required to be well burned, and free from lime; for, should the latter exist in the brick, the consequence will assuredly be the bursting of it when the lime becomes slaked with rain-water.

It is a very excellent practice, when soundness in brick needs assurance, to steep as many in water as may be required for work from hour to hour. The consequence will then be that the lime, if it be there, will declare its presence in the action of the water upon it.

We will not dilate on the well understood practice of brick-work, but leave it to those whose practiced hands can do it more justice with the trowel, than we can here with the pen.

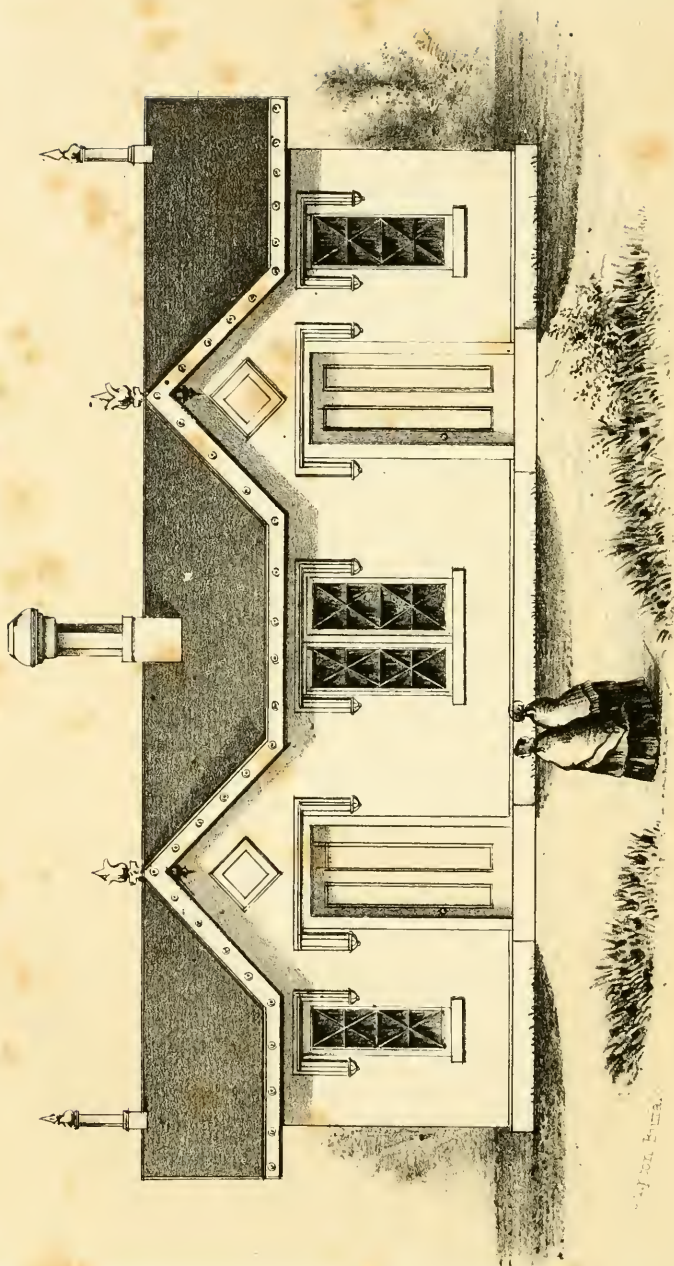
SCHOOL ARCHITECTURE.

IN our large cities the construction of public schools is receiving much attention ; and, indeed, it is most desirable that it should, for these are the nurseries of man, where the mind is not alone taught to grow, and to expand, but the physical requirements to sustain that growth of mind, and develop it to its utmost, have there, or should have, their training. What a curse to a human being is a powerful mind, dependent on a fragile constitution. How melancholy is the sight of a brilliant genius wearing out its poor attenuated human column with its very power ; a lamp whose burning brightness too quickly consumes the oil of its existence. And how true it is that in many, too many cases, this very incapability is produced at school, and firmly rooted in the constitution. Want of pure air is the certain agent of destruction to our youth ; and of all places its terrible effects are more potent and more certain in the school-room than in any other, because of the mass of exhalation from so many lungs, some already diseased and pouring forth their noxious vapors to be inhaled by the victims around.

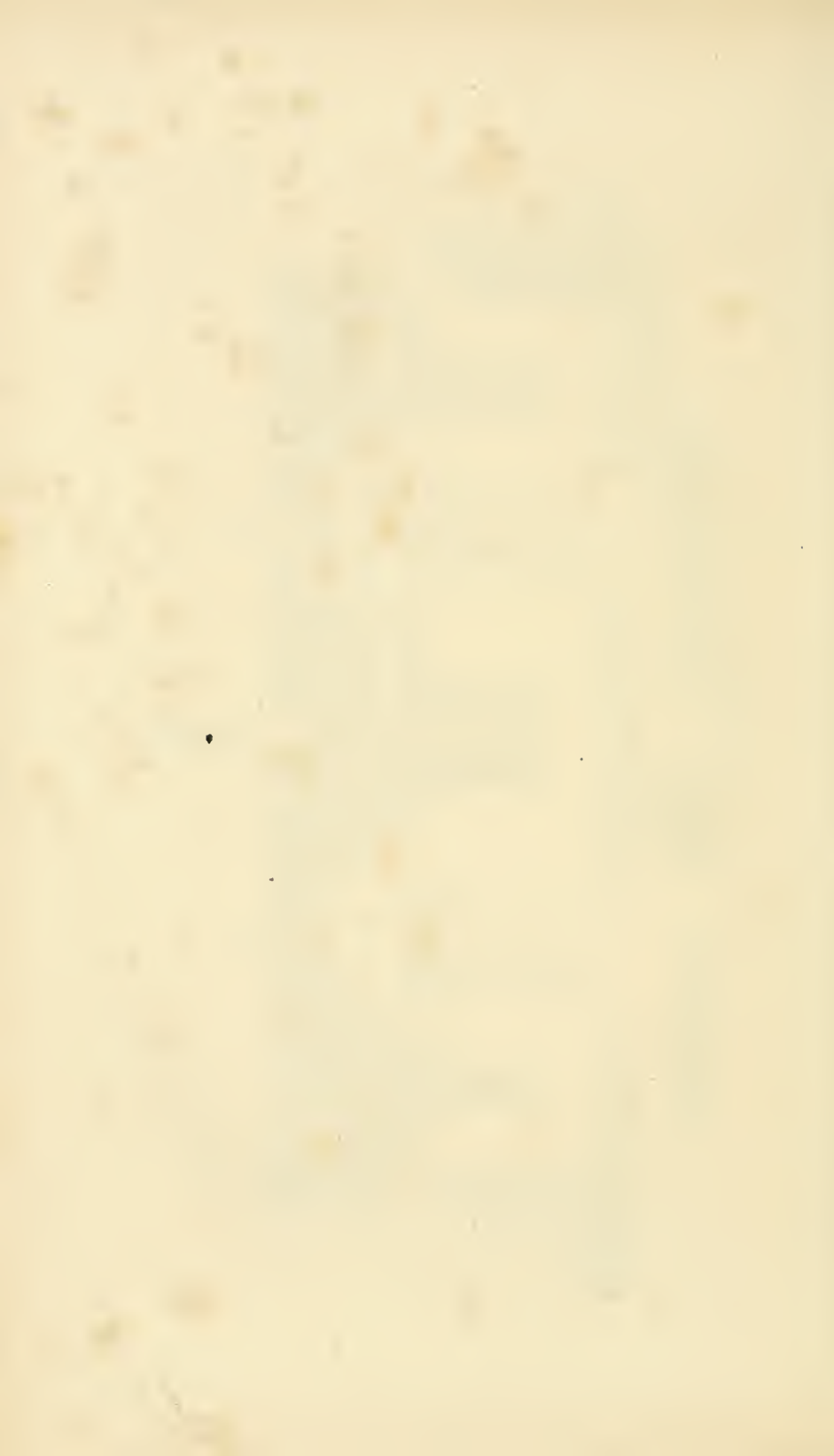
Yes, our public schools should be thoroughly ventilated. The church is occupied but for a few hours each week; not so the school—five or six hours a day, the week, the month, the year round, it is the breathing place of numbers. Then, how necessary to prevent its being the pest-house of growing humanity—the curse instead of blessing to many a fondly anticipating parent's heart.

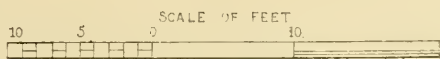
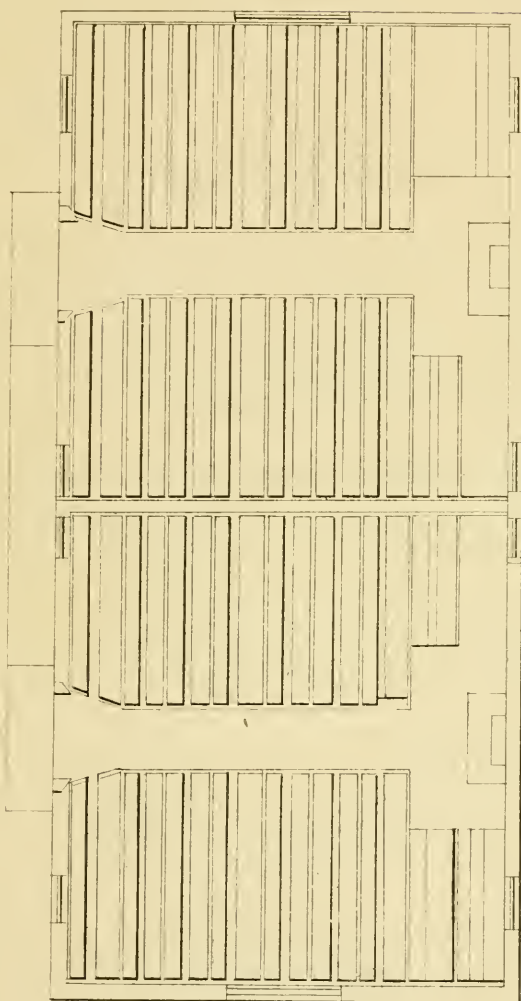
Keep the school house free from damp—warm in winter, cool in summer; but, above all, let it be thoroughly ventilated.











CONSTRUCTION IN WOOD.

THE design here given, (No. 1,) is intended for those limited localities where comparatively few pupils may be expected to assemble for many years. The structure is therefore supposed to be very economic, at the same time that it presents every facility for the purpose it is intended to answer.

This school-room is arranged with distinct sitting places for the males and females; and with separate entrances also.

The cost of construction would be reasonable, whether the material were of stone, brick, or wood.

It could, in a thickly timbered locality, be constructed of hewn logs, and yet, with very little extra cost, be made to look well.

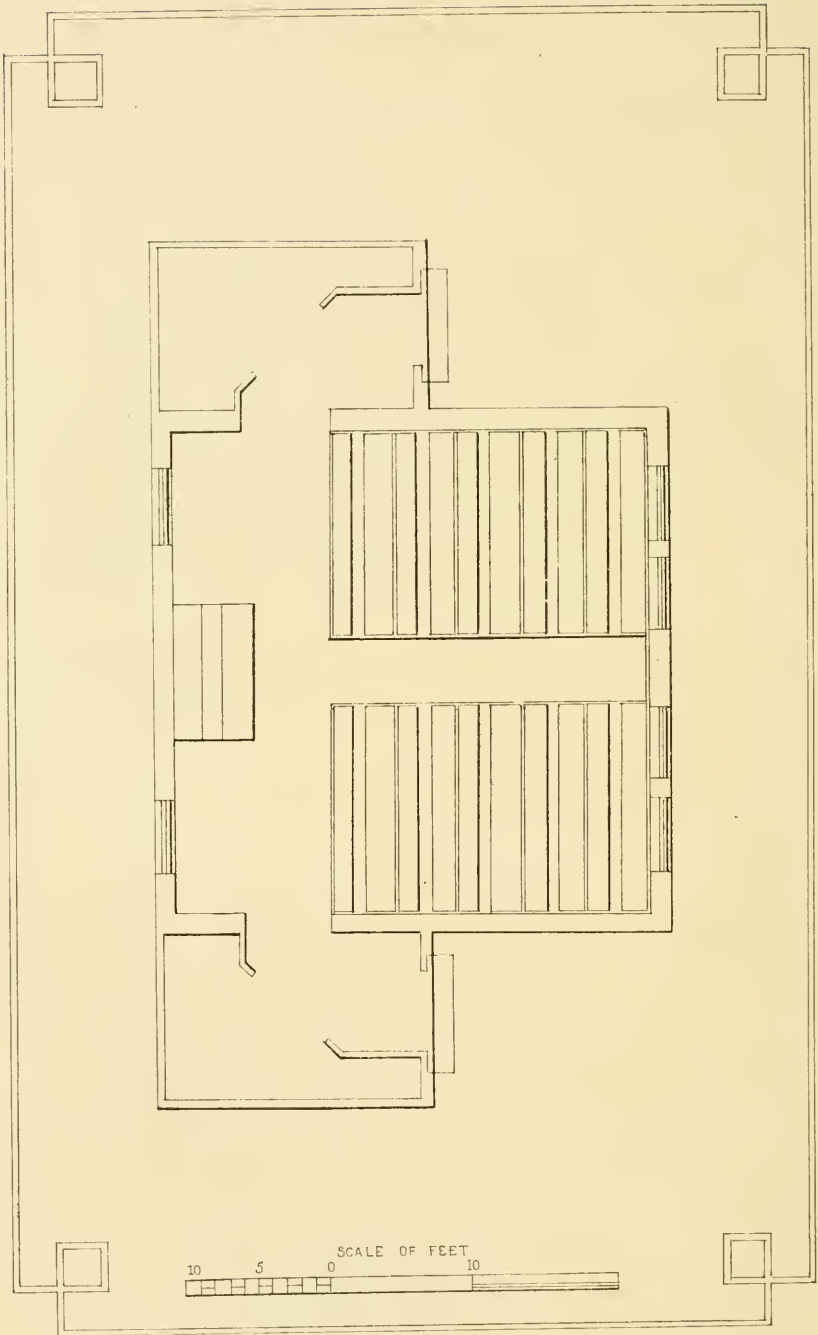
The foundation should be permanently built, and the walls be well keyed together. The spaces between flooring-joists should be filled in with concrete; the flooring being not less than an inch and a half thick, sound, and well nailed down.

The windows may either slide back upon each other, or be on pivots placed at the center. This latter is the simpler plan, and is not objectionable in frosty weather, as the former is.

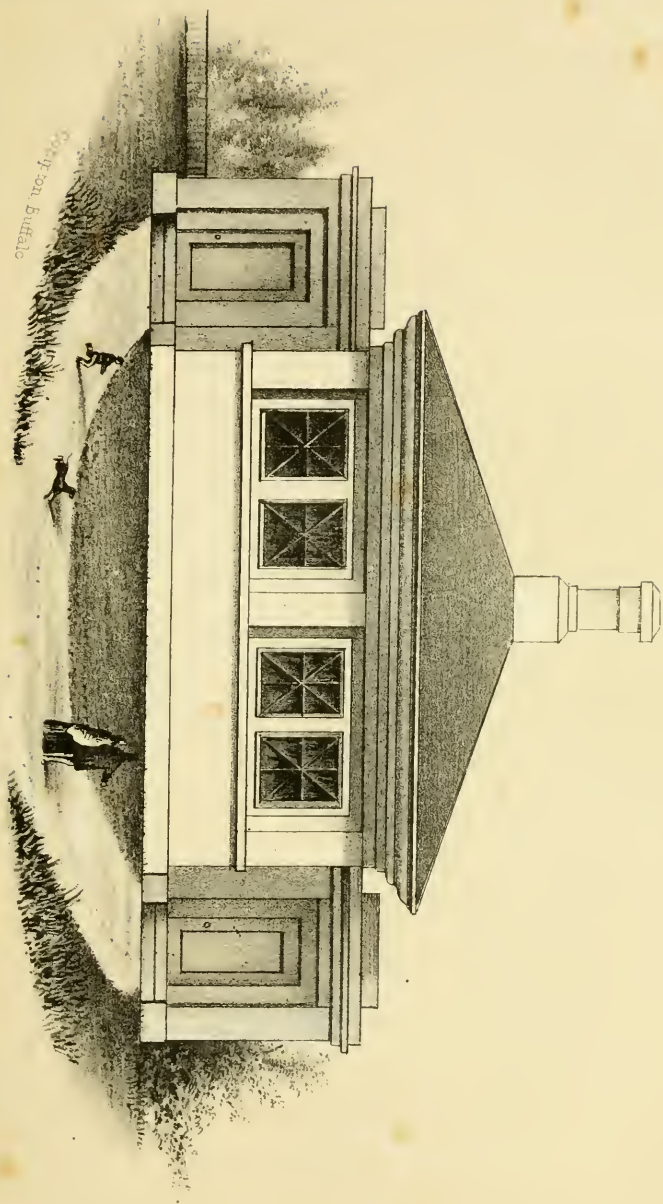
The chimney flue is to be built on the ceiling joists, and rise in the center of the school. It must be of brick.

The ceiling joists are to be 8 by 2, and 18 inches from center to center. Where the flue is to rise they are to be bridged firmly, and a flag-stone is to be set on them, at least five inches wider on each side than the chimney flue. This is a precaution against accidents by fire.

The roof will be square hipped, the collars answering for the ceiling-joists. Around chimney-flue at apex of roof, there must be a frame to receive the rafters; and this frame must be well secured by perpendicular pieces to the ceiling joists, so as to help to hold up the latter. Straps of iron should be used at the angles, above and below.



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CONSTRUCTION NO. 2.

AVERAGE ESTIMATE, \$600.

HERE is a neat and tasteful style of village school for males and females, which can be built of any material. The convenience of wardrobes is here presented, and the general arrangement of plan will be found desirable, the two schools being wholly distinct, though under one roof.

The ornamentation is cheap, yet effective; the fascia-boards over gables of porches being of inch and a half hemlock; the buttons to be of turned oak, spiked on. The doors may likewise have these buttons ornamented, as shown on elevation.

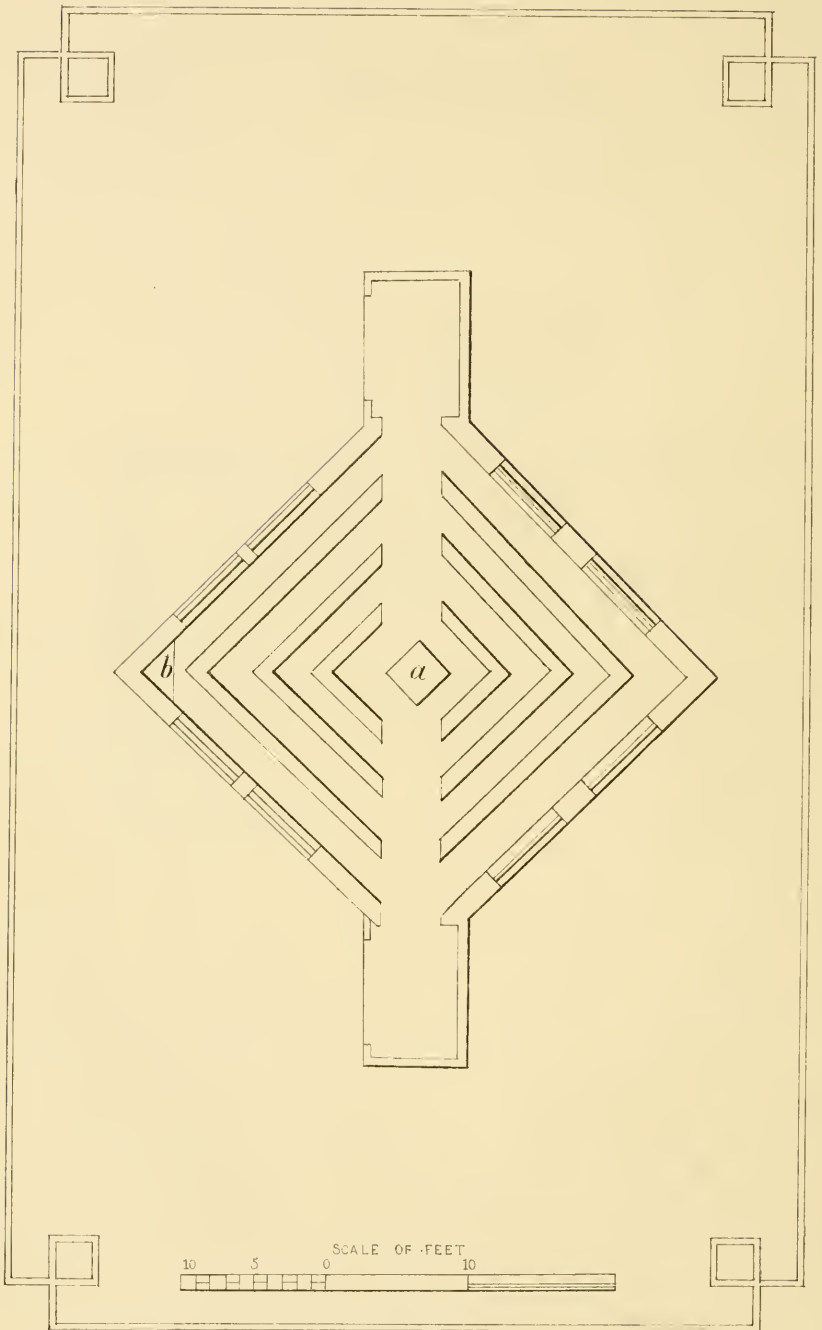
CONSTRUCTION NO. 3.

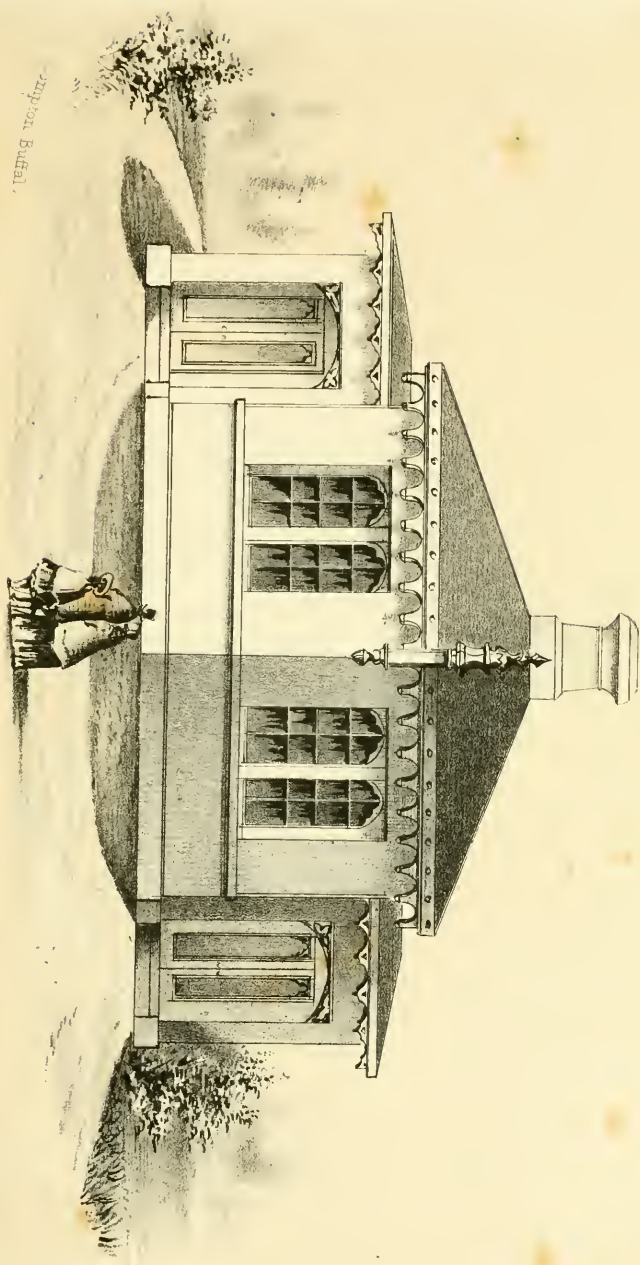
AVERAGE ESTIMATE, \$320.

THIS design is unique in shape, but in the execution of it the preceding directions will be found to answer. The internal arrangement may differ from that here given; and, instead of placing the Master's desk, *a*, at the center, the stove may occupy that place, and a platform for the Master be erected at *b*.

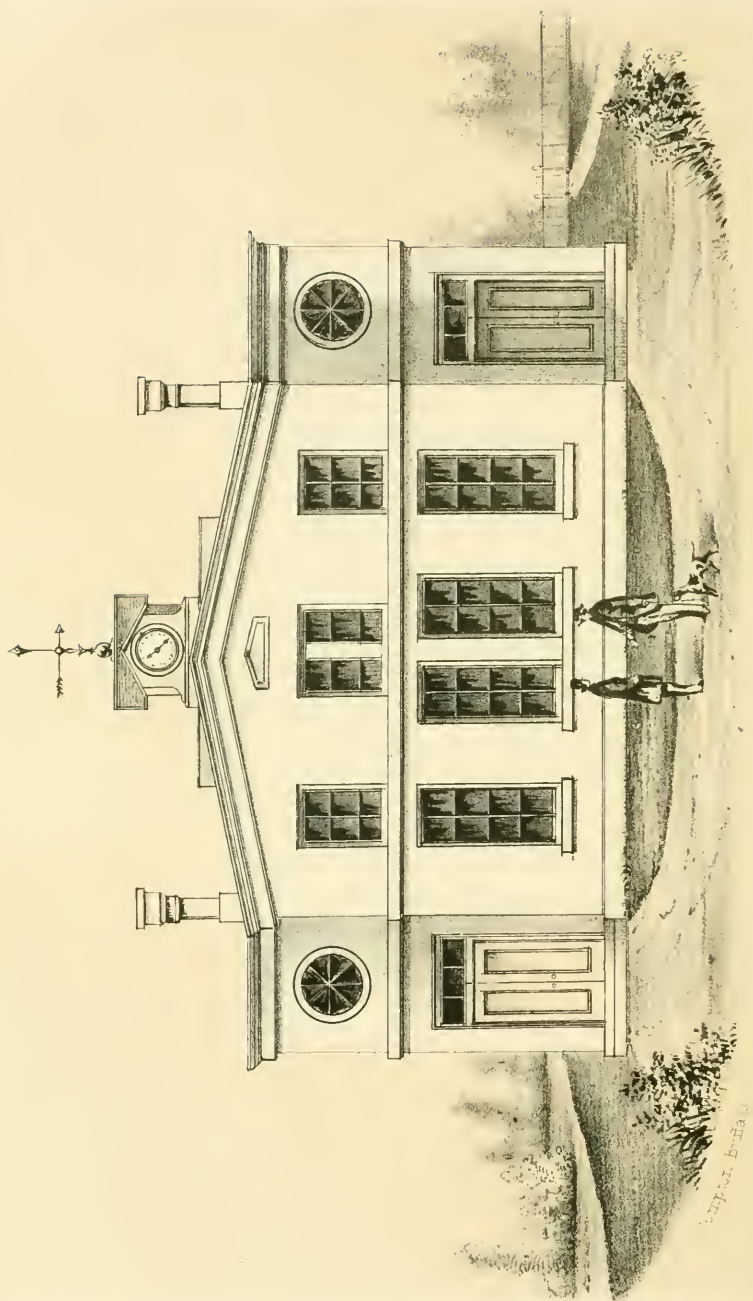
It is also suggested, that in case the lecture-board is required, one of the rear windows be built a blank for that purpose.

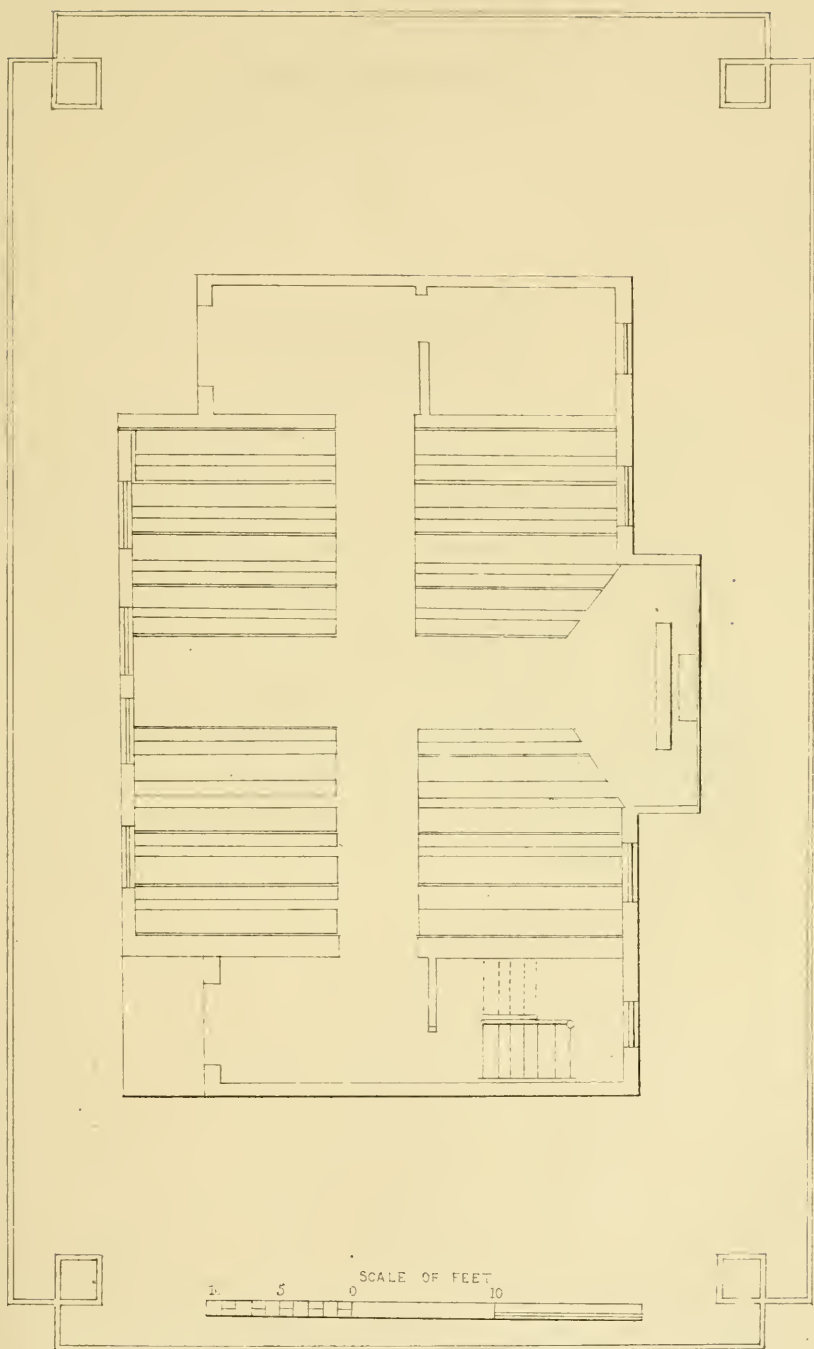
The scholars' seats may, of course, be placed as deemed most desirable.





Imperial Buffet.





CONSTRUCTION NO. 4.

AVERAGE ESTIMATE, \$700.

THE design is proposed for a large district, say a village, where a second story may be required for lecture-room, or divided for recitation-rooms. But the proposition we intended was to have the master (if a married man) live above the school. It is very obvious that many advantages would arise from this arrangement, as rent being saved to the teachers, it would induce competent married couples to undertake the conducting of male and female departments; and being constantly on the premises, more vigilance and care would, of course, be exercised. This building is estimated as constructed of frame; but any material may be used.

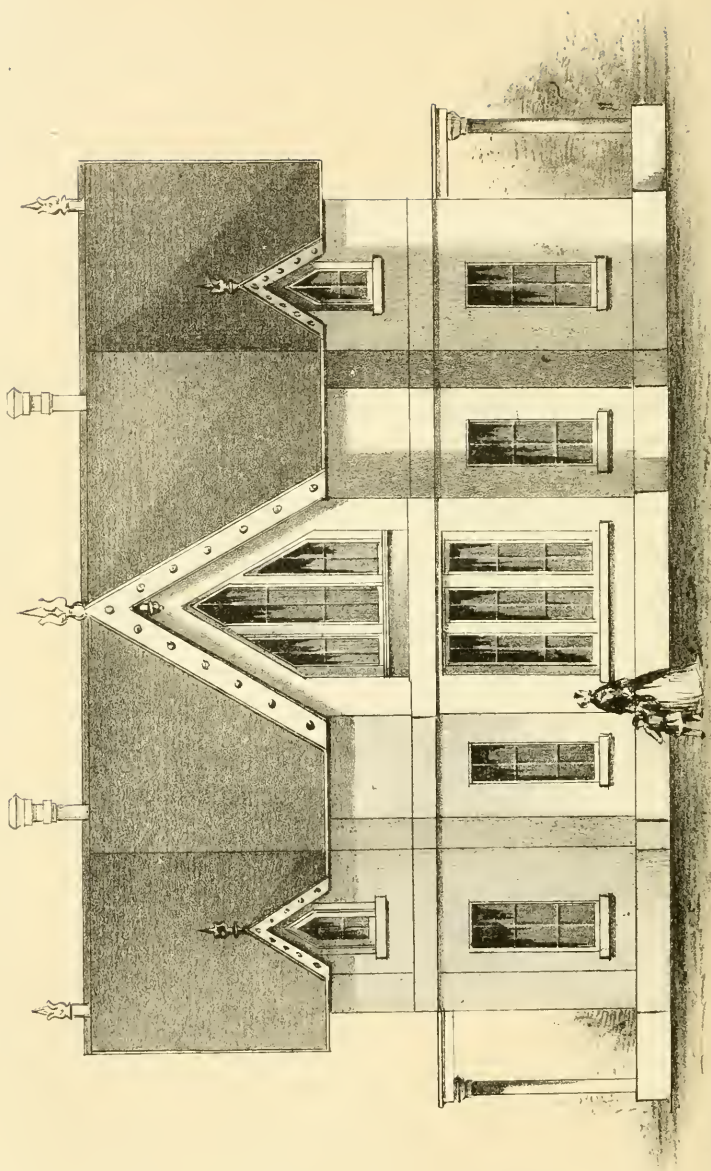
CONSTRUCTION NO. 5.

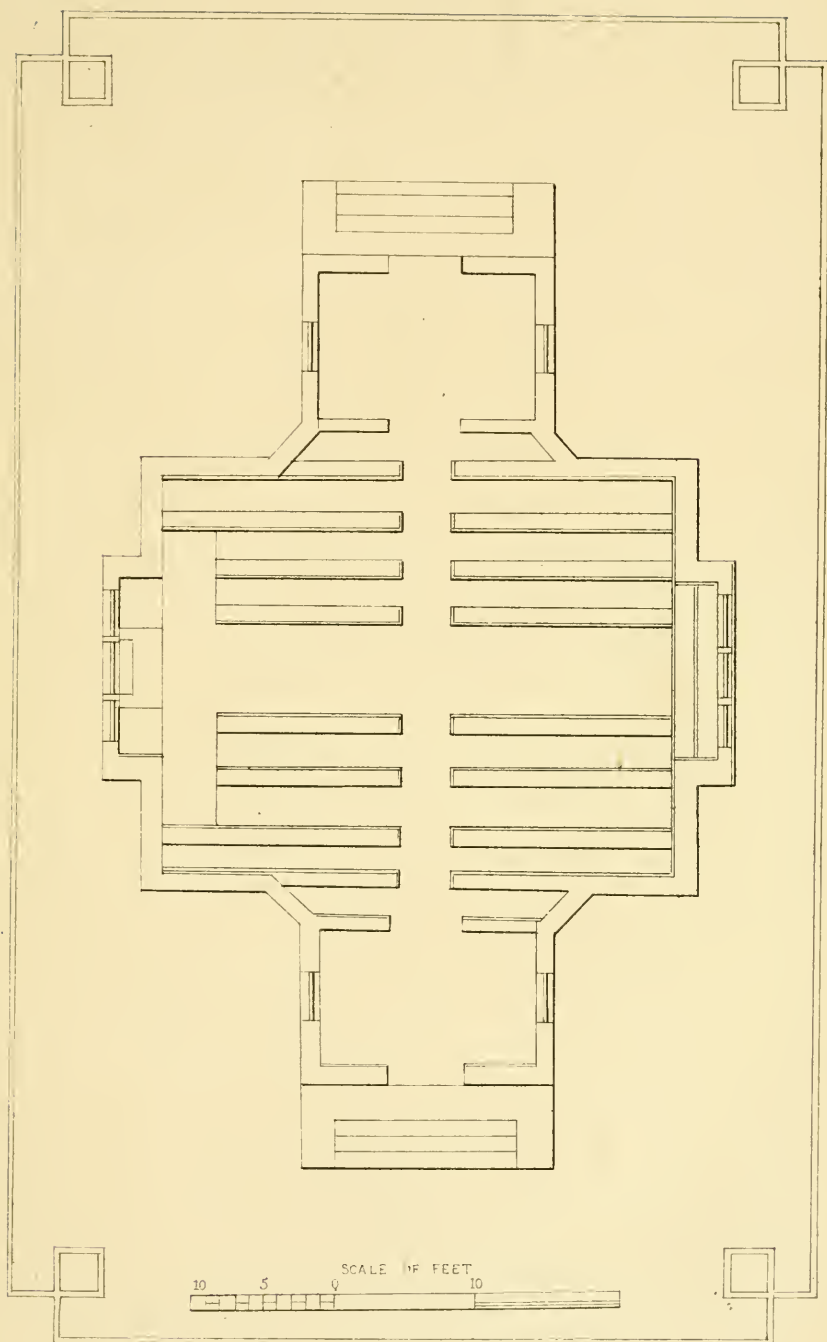
AVERAGE ESTIMATE, \$900.

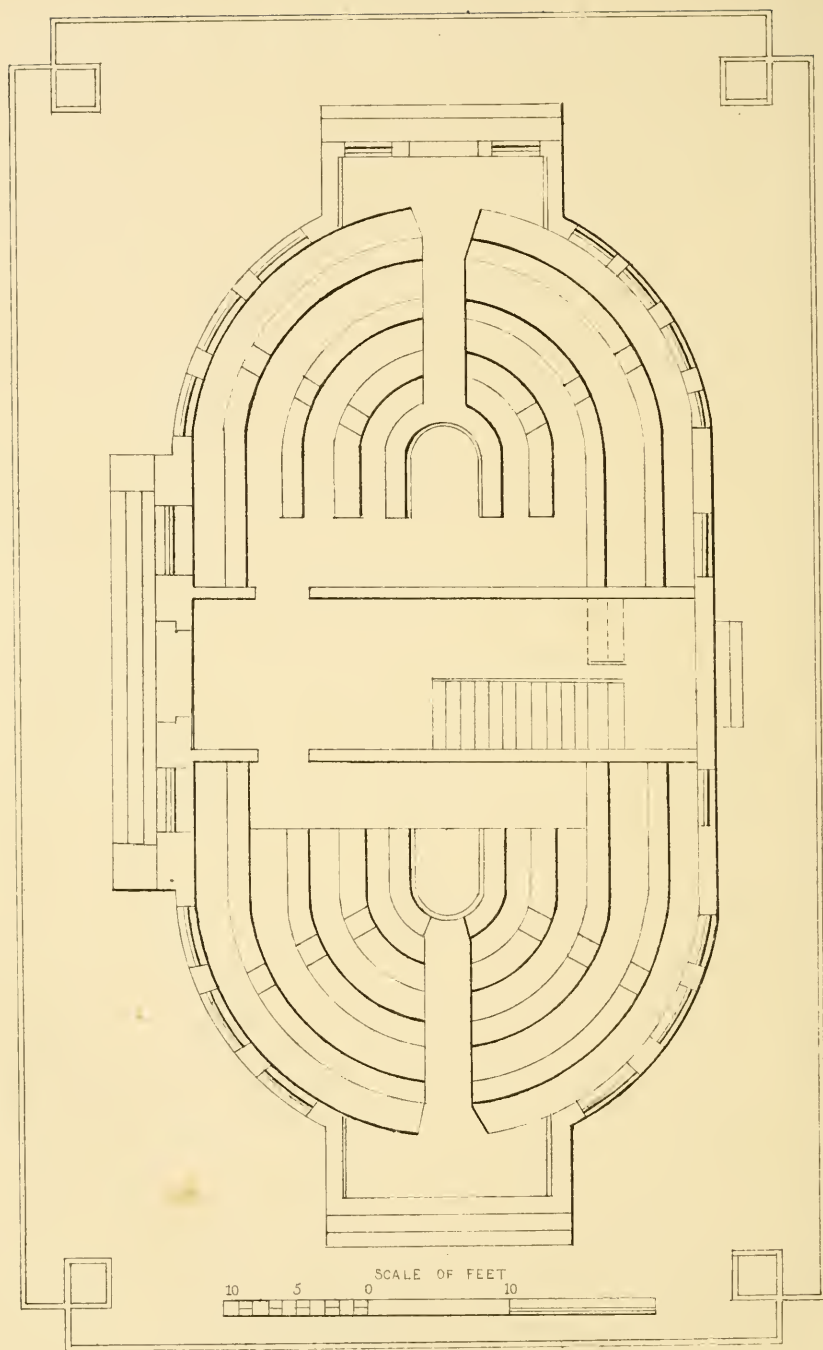
THIS is a domestic Gothic design, which will present a very harmonious effect, in a rural location.

As in a former construction, we intended this for the accommodation of the teacher's family in the second story, and would here again urge the necessity for such an arrangement, thus saving those incumbents from the too-frequent annoyance of boarding around, or hiring indifferent lodgings at every inconvenience. The structure under consideration is one which only requires a due regard to taste to make it all that is desirable.

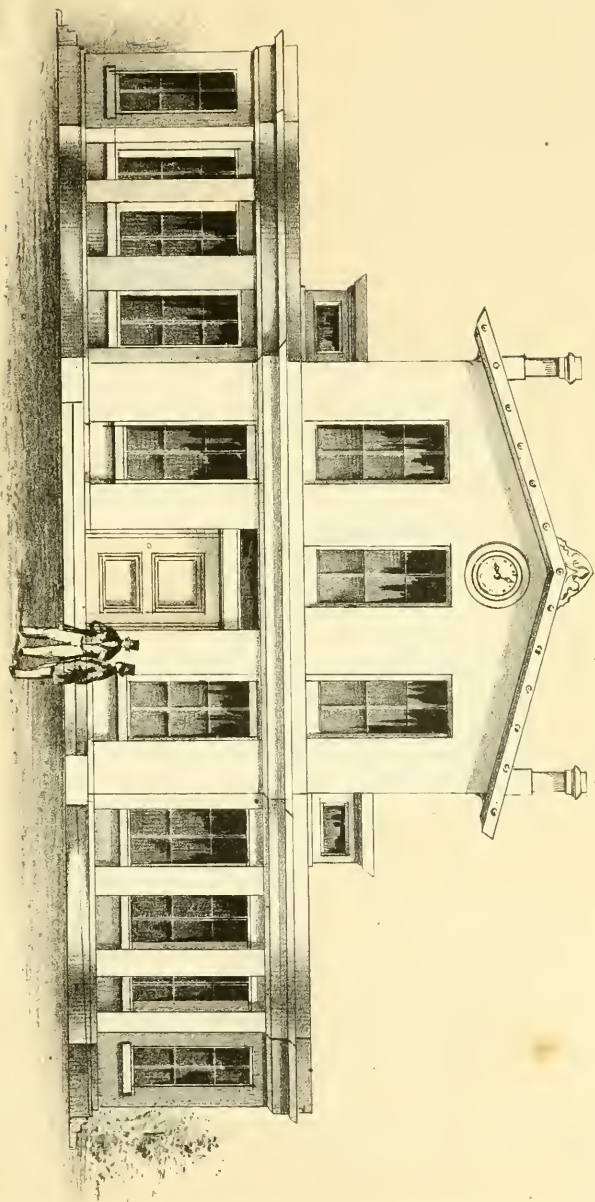
The estimate above quoted is founded on the supposition that the work be executed in frame, sided, and thrice coated in good oil color.

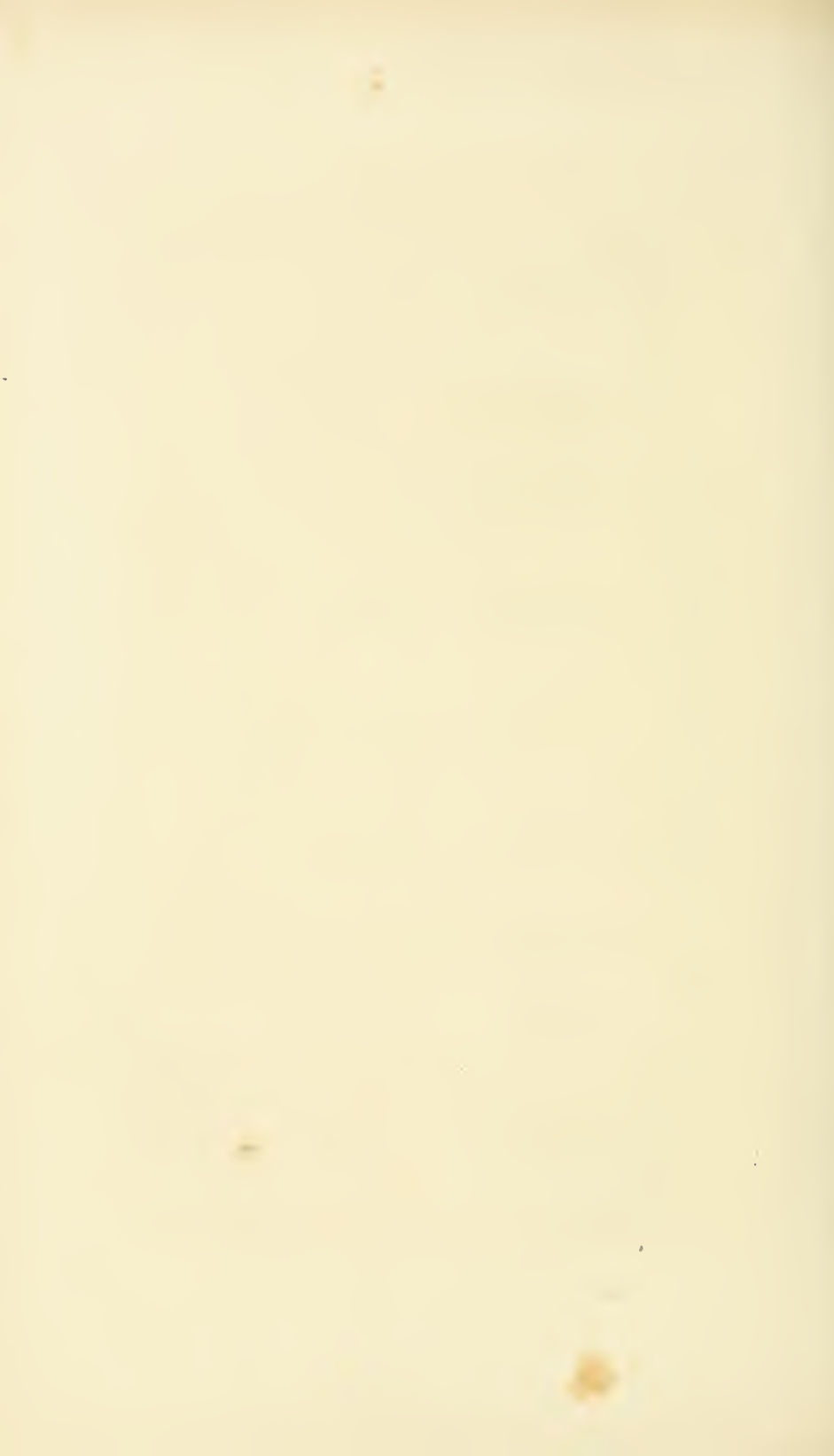












CONSTRUCTION NO. 6.

AVERAGE ESTIMATE, \$3,260.

THE Seminary here presented is adapted to the wants of towns of eight or ten thousand inhabitants. Its center is occupied by a hall with entrances to the schools of males and females, for the use of the teachers. In this hall is a staircase which leads to the recitation apartments, or lecture-room above.

The schools are each arranged on a semi-circular plan; the passages to the seats radiating to the center. There may be, of course, as many of these passages as desirable. Some teachers being anxious to have but two scholars at one desk, while some again think one enough. It will perhaps be the desire of the trustees, however, to seat as many as possible; and for that reason we have given the greatest number of seats, with dotted lines, to show where extra passages might be introduced, without greatly diminishing the general accommodation.

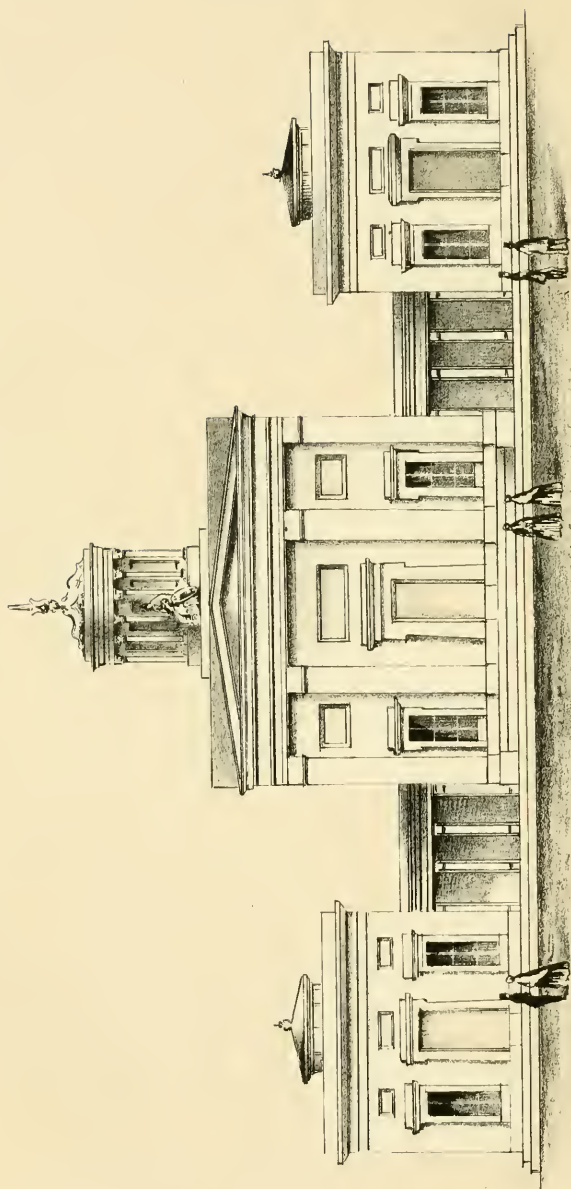
It might be here observed, that where pupils have a due amount of business, and the master occupies so commanding a position as in this plan, it is not probable that there can be much idling in the school, no matter how close the sittings may be.

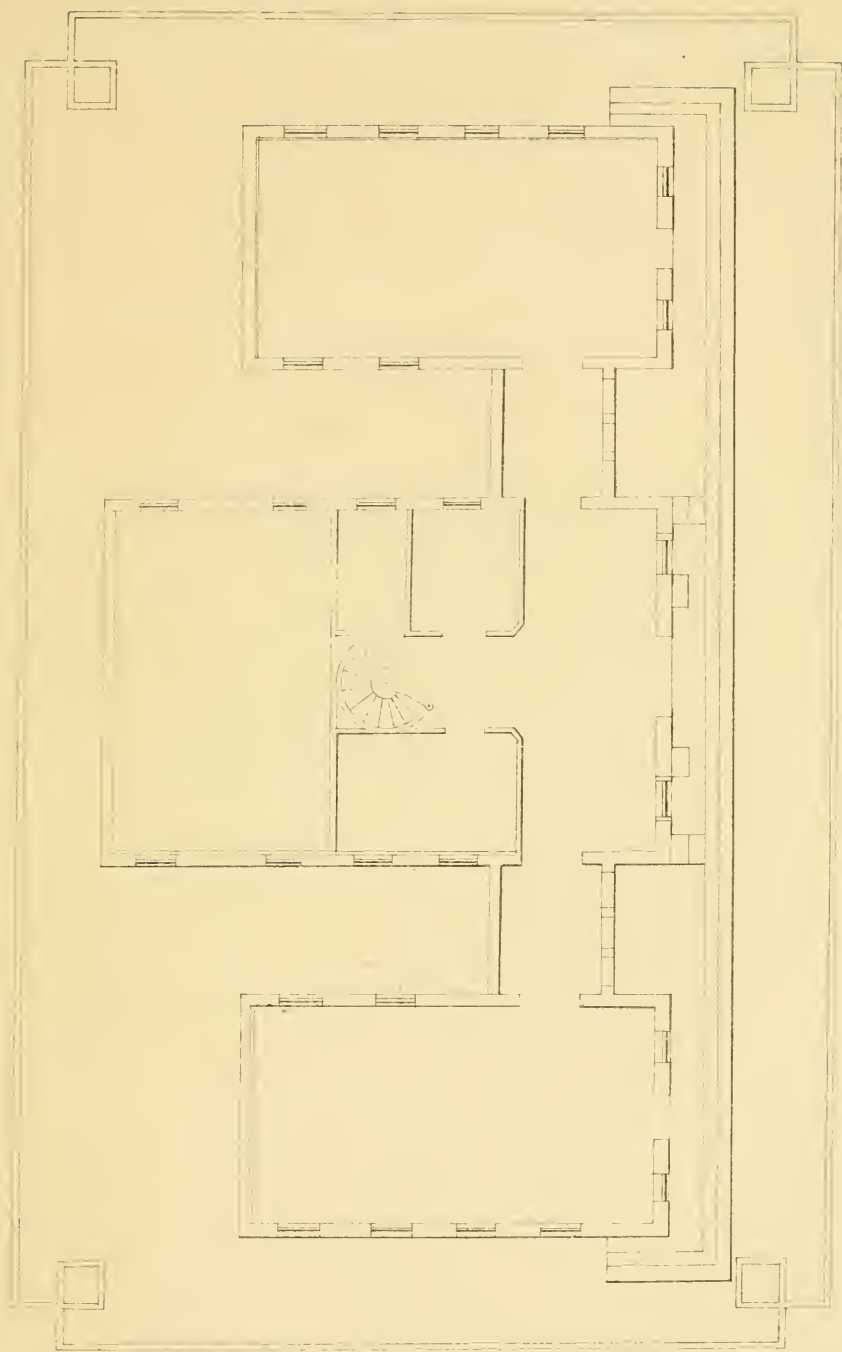
The center buildings and wings, in this plan, are proposed

to be of brick, covered with cement of a light-brown tint; and for such the estimate has been made. The construction may however be brick, faced with cut stone, which would, under favorable circumstances, add a little over one-third to the cost already stated.

It is proposed to have sky-lights in the schools—and they would indeed be very desirable, both for lighting purposes and ventilation; the windows being open in summer, and the doors also, a complete ventilation would be the consequence.

The roofing of this construction is obvious; the center being an ordinary gabled-roof, and the wings having their rafters spiked to the wall-plates and converging to the center shown on plan. The tops of the rafters to be framed into the sky-light sill.





CONSTRUCTION NO. 7.

A COLLEGIATE SEMINARY. AVERAGE ESTIMATE, \$7,500.

THE too-common practice in erecting this class of superior schools is to combine all required apartments under one oblong or square roof, supported by lofty, and of course dull looking walls. There is no excuse for a continuance of this tediously repeated plan. As village lots are cheap enough to afford sufficient frontage to produce a handsome effect, there is no economy in spoiling what might and should be a prominent feature in the locality.

The thorough lighting, and ventilation, in a building of this form, must command attention; and the distinctness of class-rooms have a due weight with trustees. Moreover, the outside appearance would, whatever may be the material used, strike the eye with its light and classic elevation.

The above estimate is calculated for a brick structure, cemented.

CONSTRUCTION NO. 8.

A CITY PUBLIC SCHOOL. AVERAGE ESTIMATE, \$9,300.

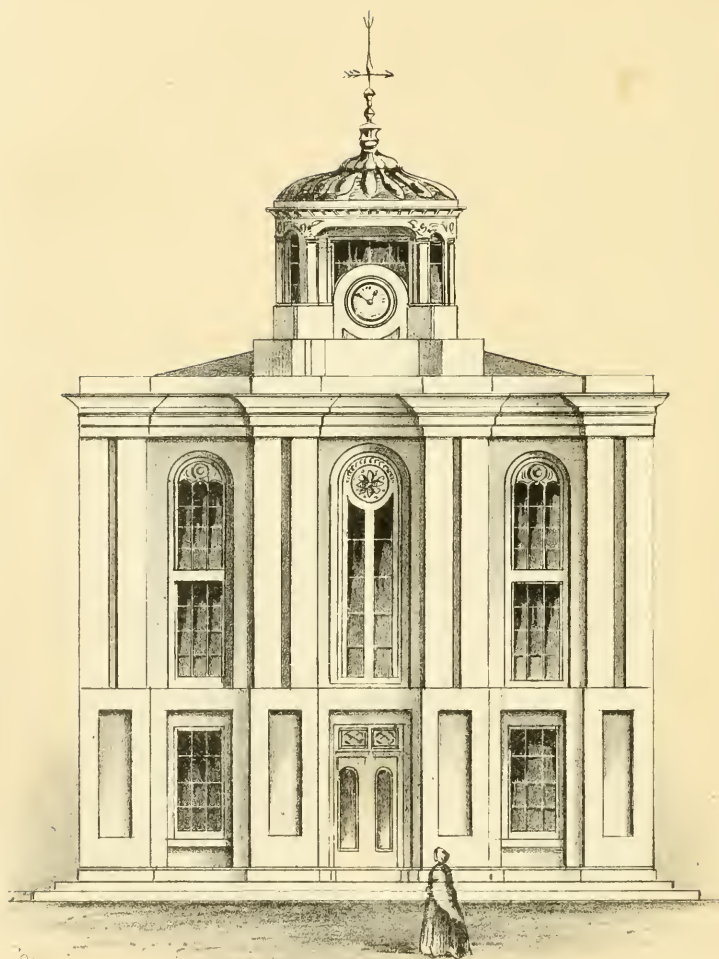
THE desire growing up among our city school districts to have buildings of more pretension than those heretofore erected, gives us an opportunity to offer the accompanying design.

The basement is calculated to be erected of brick, faced with polished red marble, on the front only. The superstructure to be also of brick, cemented and colored two or three shades lighter than the marble.

The window-caps, sills, and other ornaments, to be of cast-iron.

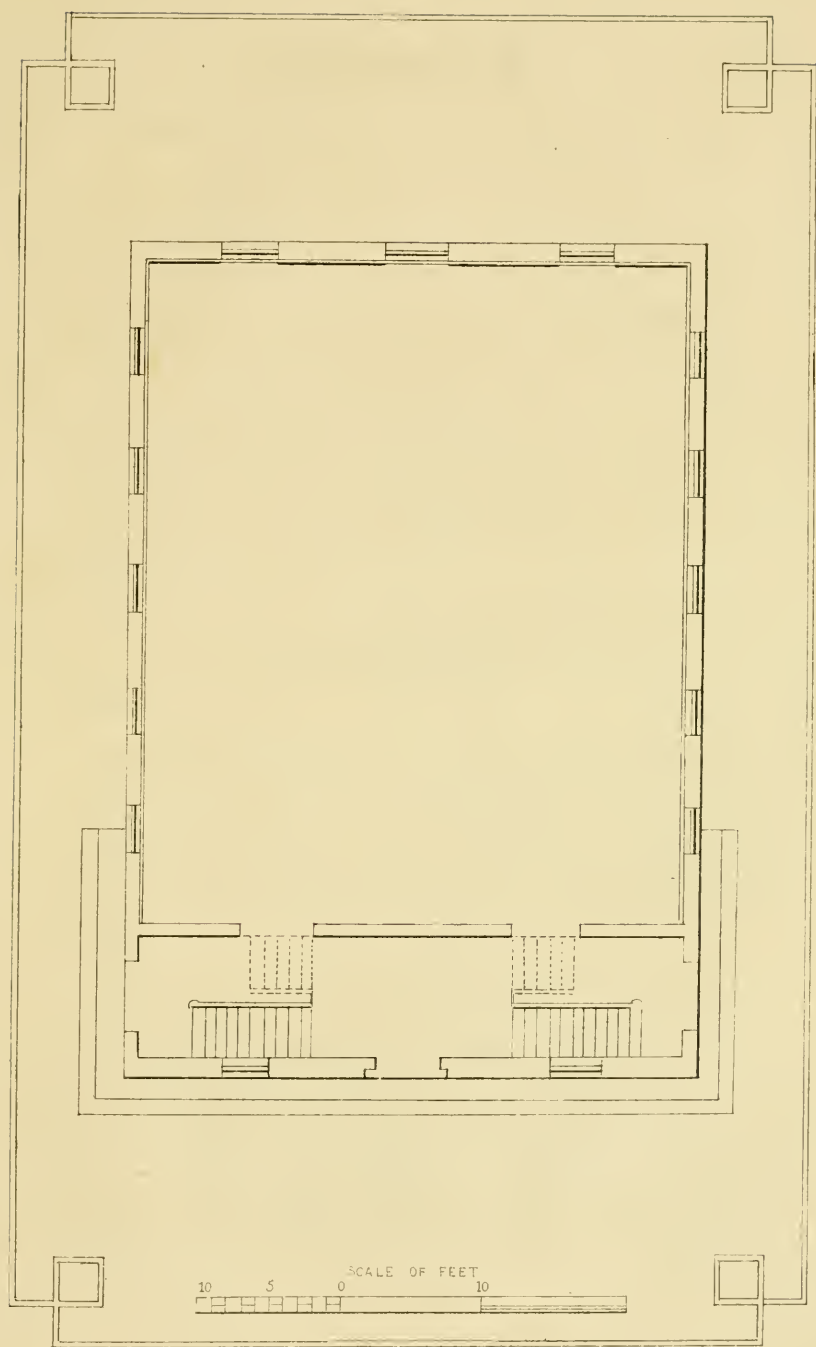
The clock tower to be well framed on inside, brick fronted, and roofed with galvanized iron, richly ornamented with cast-iron designs.

The interior will be arranged, of course, as the taste or requirements of those concerned may demand, three outside doors giving ample access and means of egress.









REMARKS ON SCHOOL ARCHITECTURE.

ALTHOUGH we have refrained from saying anything on the subjects of Heating and Ventilating, in giving the preceding distinct review of each design, we would nevertheless wish to impress our readers with the absolute necessity for the presence of both those great agents of health, in the buildings just spoken of.

Heat can always be most efficiently generated below ground, in an apparatus constructed or introduced for such purpose.

As we have already touched on this subject, when treating of Church Architecture, it is here unnecessary to repeat the hints there given. We will, however, urge the advantage of distributing the supply of heated air as equally as possible, over the school, by distinct tin conductors for that purpose.

There are many of our country districts, in which the primitive trustees will seriously object to any innovation on the good old-fashioned box, or upright stove. To such we would say: If you set any value on sound lungs for the children under your care, do not continue the use of these pernicious stoves, but apply your thoughts to basement furnaces. If in cities, where fuel is very dear, they are esteemed as far preferable even in private dwellings, how

much more desirable should they not be in villages and rural localities, where fuel is no consideration.

Ventilation is easily supplied, if the required attention be observed at the time when the building is in its commencement. For this purpose, it is only necessary to leave a parallel space of about 10 inches by 4, in the front and rear walls, at about 3 feet above floor line, with grated openings on the outside, and regulating register within.

Ventilators should also be placed in the ceiling, one at each corner of the room, ten inches in diameter, with a short, bent funnel of tin above, to prevent dust falling from the joists. These ceiling ventilators may be made very ornamental, by being covered with a tin plate, cut or perforated in suitable devices.

Thus a supply of heat and pure air, as well as the escape of foul air, are all provided for in an efficient, and at the same time, economical manner.

The walls of school-houses, if of brick, should be built *hollow*, as directed in a former chapter of this work, and the plastering should then be put on the wall without lathing. But if wood is the material of the walls, the lathing may be, without furring, on the wall, and the plaster be laid on full thick.

The object of this precaution is, to prevent the ill-usage which the wall covering is certain to receive, if the lathing be at all weak, or the mischievous genius of some who are to be found in all schools, can by any possibility pick a hole in it.

Indeed, it would not be an unnecessary precaution to

wainscot the walls from the floor-line up to the height of four feet.

The lower part of the front of seats should be boarded, and the back from the seats up, be likewise boarded. On this back, the desk for the next seat behind should rest. This back should be two feet six inches in height from the floor-line, and have a slight fall or inclination of, say, two and a half inches.

The seat should not be less than ten inches; the desk not less than fifteen inches broad; both five-eighths thick, and stoutly supported by stationary trestles not over four feet apart.

A shelf may be formed under each desk, to enable the scholars to put away their property in safety.

The wood-work of all kinds, in a school-room, should be painted drab or oak, and the passages or alleys have their flooring painted also.

The object to be gained is, the making a lasting impression of neatness and regularity, which are as necessary to be inducted into the youthful mind as any intellectual store. Such an acquirement can not fail of making the growing generation more particular about those matters, the neglect of which, in after life, renders them uncomfortable.

We have avoided, in the majority of the preceding pages on schools, saying any thing about roofing, or rather the requisite covering for roofs.

This question must be determined by the peculiar requirements or fancy of those whose judgment must be consulted. But, we would just hint that the roof which is most per-

manent, and least liable to destruction by fire, is the one which should find a preference always.

The manufacturing of such a roof is a subject already treated of elsewhere; but it may be necessary to state here, that plaster of lime and sand put on boarding to the thickness of one inch, and then a coat of tar, sand, and chalk, one inch thick, put on over that, and well beaten with spatulas or flat boards, would be sure to make a roof that would prove durable and impervious to the weather, as well as being fire proof.

GENERAL REVIEW.

It will be easy for any mechanic who is used to large works to take up and carry through any of the foregoing designs of Churches, Parsonages, and Schools—the abstracts of estimates just given being for the use of such of our readers as are desirous of obtaining for their rural locality a tasteful structure, and wishing to be enabled to form an idea as to the probable cost.

It is to be hoped that the information given in the present work will prove advantageous to all such, as well as pleasing to men of taste generally, who study the beauty and fitness of architecture for its own sake.

The more highly finished designs in the pointed style demanding the employment of the well-experienced builder, educated in his profession, we see no object for entering into the detail of their execution in a general work like the present. But should those designs ever give a sufficient hint to the reader to lead to the consummation of our desire to see any of them erected, the end at which we aimed will have been happily accomplished.

To the mechanic whose task it may be to carry out any part of the ideas put forth in these pages, we will venture to give a kindly charge: not doubting, at the same time, that his love of perfect workmanship is fully as great as ours, but for the sake of that art which we, in common with

all who study it, love and cherish with a jealous care. Do not suffer the dictation of ignorant authority or parsimonious zeal to exercise the slightest influence on your better judgment. Rather relinquish the work entirely than have that work pointed at in derision, when better taste, and a clearer perception of the rules of art, guide a future generation to judge more minutely than the present too defective education in architectural knowledge will permit.

The simplest ornament has its peculiar place under the parent style to which it belongs, and that ornament must be so rigidly portrayed as to leave no doubt as to its origin and its object. In the minutest parts be correct, and the combined whole can not fail of rewarding you.

In taking leave of our attractive subject, we would state that if the patronage of our present book be sufficient to incite to the task, we will gladly reënter on the work, and add another feature to its present too imperfect outlines.

LIGHTNING CONDUCTORS.

EVERY building, no matter what its size, should have at least one lightning-rod attached to its highest point. Public edifices should never be without them—too many fatal accidents having occurred from the want of this most necessary protection.

CHURCHES should be furnished with powerful conductors, secured to their spire, or most prominent pinnacles or gable.

PARSONAGES should have them attached to their chimney shafts as well as on the barn.

SCHOOLS should be guarded by them, likewise.

The space protected by a lightning conductor, or, rather, the area within which it will attract the electric fluid, is supposed to be twenty-five feet all around it. Lest, however, this might prove, in some unfortunate instance, a badly founded theory, it would be well to reduce this allowance as much as possible, as precaution is doubtful, if not taken in its fullest availability.

The rod should be three-eighths of an inch in diameter, of copper, in lengths screwed firmly into each other, and the surfaces presenting not the slightest impediment to the

course of the fluid. The top is to have a piece screwed on, having a point upright, and three points bent at an angle of forty-five degrees toward the earth. Those points to be three or four inches long each, and to be tipped with platina or gold.

In constructing the top-piece containing the points, as just spoken of, it will be necessary to have it a full inch square, splitting the required four points to be bent down, and leaving the center for a fifth point, standing. Where it is to be screwed on to the main rod, it should be reduced by cutting or filing, until flush with it.

Where copper can not be conveniently had, the next best material for a rod is iron, which can be wrought into one length by welding, and proceed as above directed for copper.

Care must be taken not to paint a lightning-rod. Such a coat will inevitably deprive it of its utility. The hold-fasts for conductors should be of wood, having a glass thimble or ring for the rod to pass freely through. Thus, there will be no agent to draw the fluid from the metal to the building; and being left unimpeded it will readily make its way to the ground.

The lower end of the rod is to be sunk in a preparation of sand and powdered charcoal three feet deep. Its extremity is to be split into three or four parts and bent various ways. This is to scatter the already exhausted fluid when it reaches the termination.

If water is at hand it is a good receiver for the end of the rod.

Any country blacksmith, with a little ordinary tact, can construct one of these iron conductors, to suit the required purpose.

In conclusion, we would advise that the support given to the lightning conductor be equal to the violent jar created by a stroke of the electric fluid ; which caution, if not attended to, might make the conductor instrumental of calamity, rather than of protection.

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WATER SUPPLY.

NOTHING is more wanted on school premises than good, wholesome water for drinking, and few things more desirable than soft water for washing purposes.

In the country a deep well should be sunk as near to the school-house as possible.

In the city, if there be water-works, the pipe-water should be introduced. If no such supply can be had, a good serviceable pump, or two, (one for the boys', and one for the girls' departments should be supplied.

A cistern, for soft water received from the roof, should be sunk in each yard; and such cisterns should contain not less than two hundred gallons of water. A long trough should be set up in a wash-room adjoining the wood-shed, supplied by a small pump from the cistern below; and this trough should have a valve and stopper, intended for the escape of waste water. These cisterns might be made available for hose supply in the event of a fire.

Children could not have a greater luxury in the heat of summer than cool, soft water to wash faces and hands in.

Certainly nothing could more promote the health of schools than a due attention to this subject on the part of those who have the guardianship of such institutions.

For drinking purposes, clean, serviceable vessels should always be at hand for the use of the children, and there should be several such vessels.

The vessels should not, on any account, be lined with brick, as such lining is sure to give a strong flavor to the water after a few years. Limestone or sandstone will constitute the very best lining for wells.

Wood, as a lining, is no less objectionable than brick, for the same reason.

ESTIMATING.

THE wide difference between the various parts of this extended Union in the price of materials and cost of labor, must render an approximation to actual value of either, in any required locality, utterly impossible. True, we may compute according to the highest market, and again according to the lowest, and then strike an average; but this at best gives but a very unsatisfactory result. We have therefore come to the conclusion of giving for each of the Church designs embraced in this work, a general bill of quantities. The reader will have only to affix the current price to each item, and calculate accordingly.

KEY.

In the **FIRST** *column* will be found the number of times any quantity is to be multiplied.

In the **SECOND**, the description of work or material.

In the **THIRD**, the quantity, found either in feet and inches, or in cubic yards, etc.

In the **FOURTH** *column*, which we leave blank, will be the market rates of each item, which the reader will fill up.

In the FIFTH, which we also leave blank, the estimate will be figured out.

The reader will readily come at a correct knowledge of the value of the required work, by making use of the help here given to him, and adding any items he may think desirable.

COMPUTATION OF QUANTITIES.

MATERIAL AND LABOR required in executing the design for a Church 35 by 60 feet, and 22 feet high to eaves:

A.

NO.	ESTIMATED IN WOOD-WORK—PLANK ON FLAT.	QUANTITY.	PRICE.	AMOUNT.
2	Side walls 60 ft. high each, composed of $1\frac{1}{2}$ in. stuff, 8 in. wide, containing, board measure,	21,120		
2	Front and end walls, 35 by 22 feet,	12,320		
2	Gables, 35 by 10 ft. by 8 in. thick, each,	5,600		
2	Walls of tower 13 ft. 6 in. by 26 ft. made hollow, of 2 in. hemlock, plank-on-end inside and out, . . .	2,808		
2	Do. 10 by 26 ft. do.	2,080		
1	In belfry,	3,200		
60	Joists under floor, 12 by 2 by 34 ft. long,	4,080		
	Flooring boarding, 58 by 34 by $1\frac{1}{2}$,			
40	Pairs of rafters, 24 by 6 by 3, . . .	2,958		
40	Ceiling joists, 34 by 8 by 3, . . .	2,880		
6	King posts, 6 by 3, 10 ft. long each,	90		
6	Pairs of struts, 4 by 3, 7 ft. long each,	84		
2	Boarding on side of roof, 62 by 25 in. stuff,	3,100		
	$1\frac{1}{2}$ in. stuff in seats of slips, . . .	354		
	Do. in backs and fronts,	560		
	In reading-desk with seat, etc., . .	180		
	Paneling of slips, reading-desk, etc., $\frac{3}{8}$ in. thick, containing 130 yards square,	656		
	In 16 windows 15 by 3 ft. each, and in 5 doors,	483		
	Total of lumber, inch measure, . . .	65,613		

2,316 cubic ft. of concrete for foundation will take 145 bushels of water-lime and 1,592 bushels of sharp sand and coarse gravel mixed

ESTIMATE

FOR MATERIAL AND LABOR required in the erection of the design B, 70 by 30 by 20 ft. to eaves—estimated in brick-work :

B.

142,000 of brick in the entire building, at per thousand,
sand, \$......

3,300 cubic feet of masonry in foundations, containing
200 perches,

4,060 feet, board measure, of flooring joists,

3,750 square feet of flooring boarding $1\frac{1}{2}$ inch thick,

7,230 feet, board measure, in rafters,

This roof is to have a double set of rafters, one set to form diagonal braces with the other. The whole quantity of lumber required is here given.

633 feet of king posts, struts, and braces, \$......

2,100 feet of boarding on roof,

ESTIMATE

FOR MATERIAL AND LABOR required in the erection of a Church 68 by 30 by 20 ft., in stone:

C.

2,240 cubic feet of foundations, containing 1,680 bushels of concrete, or 135 perches or rods of masonry, at....per....,	\$.....
443 perches, of rubble masonry in superstructure,
200 perches of rubble masonry in octagon and buttresses,
140 feet lineal cut stone in hood-moldings, over ten win- dows — the girth of those hoods would be 18 in.; therefore, the superficial square ft. would be 210,
151 feet lineal of cut stone in barge course, belt courses of tower, belts of octagons, etc.,
20 squares of flooring,
28 squares of roofing, $\frac{1}{3}$ pitch, plain truss,
425 yards of plastering on walls, ceiling, etc.,
3,850 laths required; or $38\frac{1}{2}$ bundles,

THE

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ADDENDA.

SCHOOL FURNITURE.

THERE has been a very wide field for improvement in the accommodation and economy of school furniture, and nothing has been so much neglected. While our cabinet-makers are wearing out their intellect in striving for preëminence in the make of an original rocking-chair or footstool for indolent adults to indulge themselves, the small requisites which the growing youth demand for comfort in their daily toil of study are overlooked altogether. Hence the school-room is naturally looked upon by the pupil as a place of rough usage, where it is his unhappy duty to attend to his imperative task. Such should not be the case; the school-room should in all particulars present an inviting, rather than a repulsive appearance to our youth. Let MINERVA look more like a kindly mother, and her tiny temple be more of a home to her favored children. In this way, education will acquire more seductive power over the young mind than as under the present too long existing system. What does the recollection of the school-room recall in the minds of the grown generation, as it did likewise in those of their forefathers, but a forbidding scene of whitewashed walls, endless rows of desks, and the stiff, supervising aspect of the teacher's tribunal. Nothing to break the dull monot-

ony of wall, save, (in some instances,) a map of "The World," or a black lecture-board.

With the hope of improving this objectionable state of things, and of making the intellectual nursery a place that may be sought for its comfort's sake, and remembered for its appearance as well as for its gifts of knowledge given, we will now proceed to enumerate and detail the things most wanted to make it what, no doubt, every parent and pupil would wish it.

THE DESK AND SEAT.

IN country schools it has been customary, for the sake of saving space, to have but a few desks, to be used by those learning to write: the remainder of the room to be occupied by seats. This is a bad plan, if it were for no other reason than that it inclines the pupils to a stooping position: as few children could hold up a book for hours, not having a desk whereon to rest it, without placing it on their lap, and of necessity bending over it. No; let the very youngest child have a desk high enough to insure freedom from spinal affections, which the stupid mode just alluded to is but too certain to promote.

These desks should be of elevations to suit the growth of the pupil, and each should have a gentle inclination also.

A groove should be furnished to each pupil's desk, to receive and hold his ink-bottle—the ink-bottles to be all collected and put away when tuition in writing is over for the day, to be distributed again when next wanted. A drawer or shelf should be placed under each desk. A stationary shelf would perhaps be best, to prevent the occasional inconvenience, to a neighboring pupil, of using the drawer.

The slate should have a pair of fixed grooves for its berth.

Each pupil should have 20 inches of desk-room, and the

breadth of the desk should in no case be less than twelve inches.

Along the bottom rail or stand of the desk, there should be a horizontal foot-board, four inches wide, raised three inches from the floor, on which the pupils may rest their feet.

The back of each desk will, as observed on a former page, act as the back of the seat in front of it; and these backs will have a gentle inclination, so as to carry out the healthful doctrine of expansion of the chest. And here it may be remarked, that the closer in upon the sitter the desk is placed, the more certain is the prevention of the pernicious habit of *stooping*.

THE SEAT.

In forming the seat, the principal objects to be sought are, the accommodation of the hight, the necessary width, and the due inclination of the foot-board spoken of above.

The required hight must be found by having three standards: one for the youngest, one for the eldest, and one medium. 'T is true, the raising or lowering of the foot-board may be made to meet this requisition; but it would be more advisable to have pupils located in accordance with relative age and size.

The necessary width should not exceed ten inches, nor be less than eight.

The due inclination of the foot-board may be thirty degrees, or a degree or two more, so that the flat of the foot may rest easily when sitting up or when writing.

And here we would offer a suggestion, which, if carried

out, might be of infinite service to the rising generation, especially the female portion. It is, to have slats screwed on to this foot-board, to form positions in which to place and retain the feet, so as to overcome that repulsive habit which too many children acquire of *turning in the toes* when sitting, standing, or walking.

THE WALL FURNITURE.

EVERY available space between windows should be furnished with some large map or illustration. The orders and styles of Architecture should be displayed, and occasionally lectured on, so as to give pupils some insight into an art which has exhausted the taste and invention of mankind, which gives pleasure to all, and yet whose rules of construction are seldom known to any save the one whose peculiar business it is to make himself acquainted with them. In the same way might Geology, that wonderful science, which acquaints us with the properties of the very planet we inhabit, be brought constantly under the inquisitive eye of the curious learner. In fact, every branch of human information, mechanical and physical, might be thus exposed to inspection, and mayhap a latent spark of embryo genius thus find its way to kindle up and illumine the world with heaven-gifted knowledge that might never seek out, in the bound pages of a book, the subject it was born to enlarge upon.

Let everything in and about the school-room wear an inviting aspect; and even the lecture-board, that black and repulsive-looking object of terror to the young, be a brilliant blue or red. There is no excuse for making it black. Chalk will show as well on the colors named in the limited range of a lecture-room.

In the larger schools or collegiate seminaries, it would be an ennobling feature to introduce life-size busts of the great men of America—the patriots, the philosophers, and the statesmen, that their presiding genius may incite the young to emulate their greatness, and so become themselves the proud monuments of national glory. Let these busts be placed in an elevated line, regulated as circumstances may require; but the niche above the teacher's seat should be the place for the bust of him whose virtues were unrivaled, and whose position in the hearts of his countrymen should thus be upheld in the united affections of the young.

INTERIOR COLORING.

ALTHOUGH white is a very neat and lively color for the walls of a school-room, yet it must be recollected that as there is no scarcity of windows, there is no actual necessity for having the lightest of colors. And as it is the most hurtful of all to the eyes, it must, on this latter account alone, prove highly objectionable.

A cream-color, a delicate rose, or a light straw-color would have a very pleasing effect, particularly when set off with the illustrations spoken of in the preceding chapter. It would be less like "school" and more like the home of mental enjoyment. It would be more sought after as a pleasant gathering place for aspirants for knowledge. The bright, gay color of the walls would reflect its warmth upon the youthful mind as a summer sky enlivens even the dullest heart.

There is more, far more philosophy in this simple thing of color for a school-room wall than any know, save those who try its gentle, telling influence.

The busts we spoke of in the preceding chapter may not be within the means of some localities to obtain. In such case, the large-sized, lithograph portraits may be substituted with good effect; making sure to have all of the same size,

as uniformity is, of all others, the most desirable lesson to be inculcated by every available channel.

The desks and seats should be of some neat color, and the frames supporting them should likewise be suitably painted.

The alleys dividing the desks should, if not matted, be painted. But, if possible, they should be matted, for the purpose of carrying out, as far as possible, the idea of home comfort in the school-room.





